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MOBILE RADIO TECHNOLOGY

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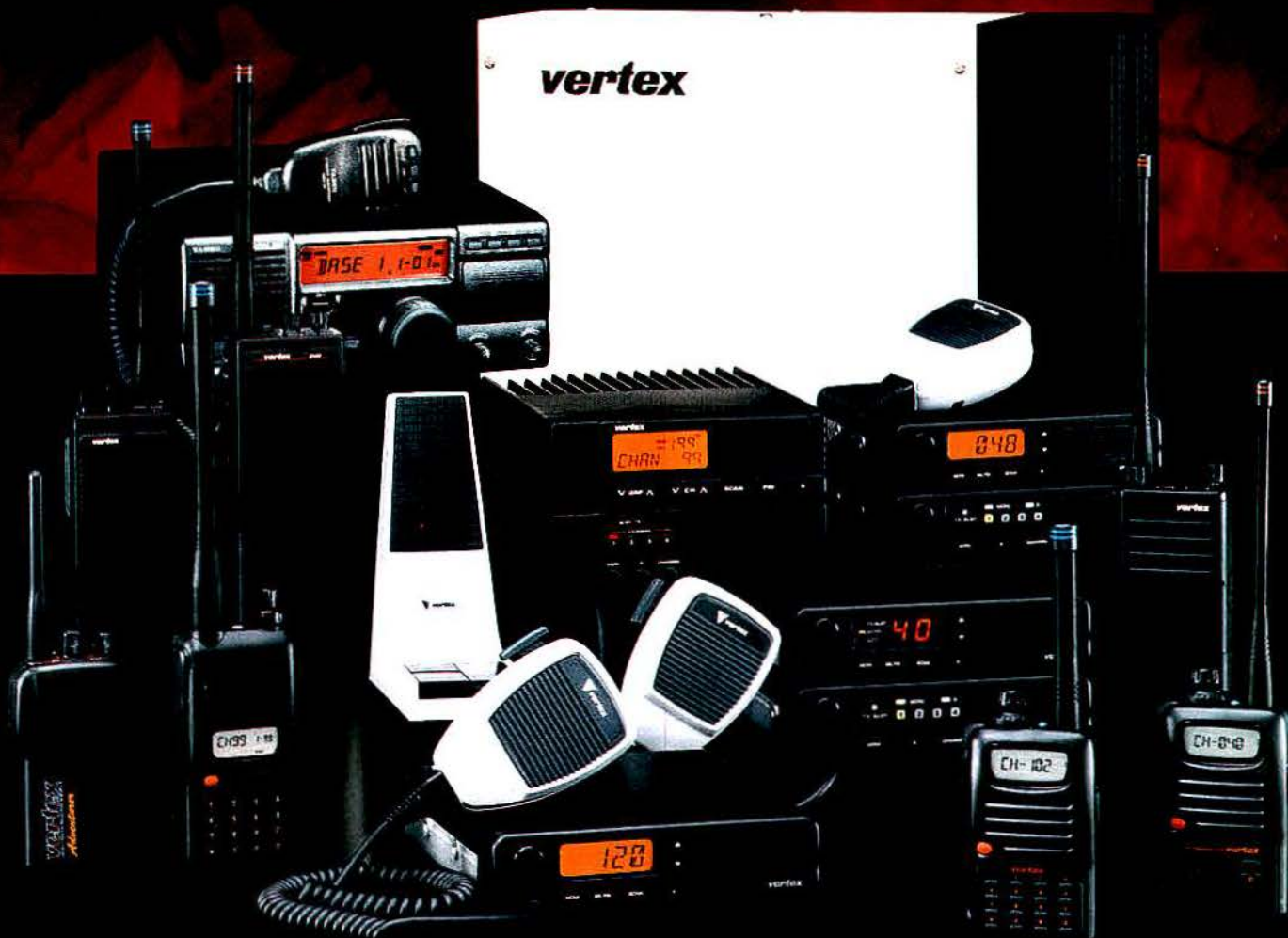
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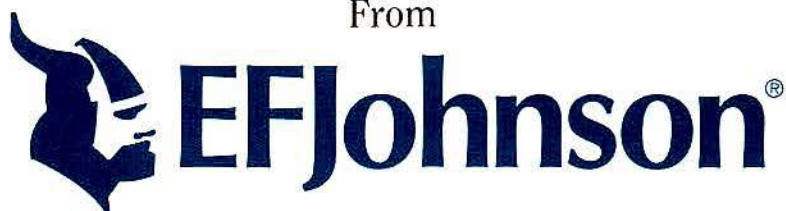
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TECHNOLOGY

January 2001
Volume 19, Issue 1

On the cover: TETRA is on the brink of penetrating the North American market, but it must be approved by certain manufacturers.

What do politics and disasters have in common? No...its wireless messaging. Story on page 30.



Features

PS2 Is your two-way radio system *unbalanced*?

Patrick E. Buller

The base station noise floor, vehicle noise and ambient noise in the service area can all contribute to throwing a radio system out of balance. Here's how to fix it.

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Don Bishop

The TDMA technology from the other side of the pond is poised to gain a foothold in the American public safety communications market.

30 Supporting a two-party system

Sean Petty

Site infrastructure for wireless messaging that was used to support the national political conventions also shows promise for disaster relief and site startup applications.

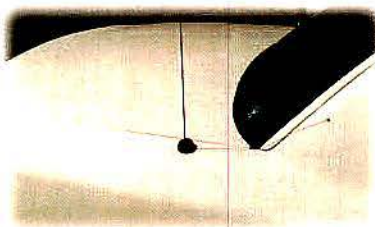
32 What you should know about refarming

Robert J. Speidel

What do the refarming orders *really* mean, and how do they affect your decision to use centralized or decentralized UHF trunking?

36 Product/services showcase

Advertisers in this issue provide information on land mobile radio products and services.



Find out how to balance your two-way system. Story on page PS2.

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Get off the sideline

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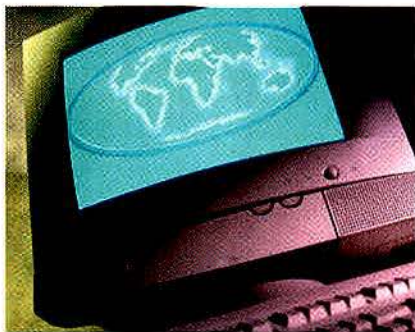
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WWW.MRTMAG.COM - highlights

Transcrypt cuts 26% of EF Johnson's employment

In a letter to shareholders, Transcrypt's chairman stated that the company would not reach its 2000 financial goals.

Motorola fights illegal radio resellers

Motorola has issued cease and desist letters to more than 10 sellers and importers of foreign Motorola two-way radios in the United States.

Nokia launches TETRA system for 800MHz

Nokia launched a new TETRA system on Oct. 24.

CommScope enhances coax cable

CommScope, Hickory, NC, has announced an enhancement to its 1 5/8-inch Cell Reach cable.

Industry media

Flarion Technologies launches newly designed Web site.

Industry people

Javier Staffanell joins Decibel Products, Dallas.

Reader letters

Unlicensed microwave secondary to licensed radios.

Calendar of events

Pack your suitcase for mobile radio trade shows.

How to get an article in MRT

Be an author—guidelines for submitting articles.

Marketing services

Marketing contacts and advertising opportunities.

Industry links

Links to industry association Web sites.

News & Analysis

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Stocks & Finance

Get updates on quotes, including a view of fastest-moving telecom stocks.

Magazine Rack

Check the Magazine Rack for trade magazine content in an easy-to-browse format and search back issues. The rack includes:

- Mobile Radio Technology
- Site Management & Technology
- RF Design
- Satellite Broadband
- Wireless Review
- Telecom Business
- Telephony
- Global Telephony
- Utility Business
- Cable World
- Upstart

Buyers' Guide

Use a combined and expanded view of all the buyers' guides from related publications in the magazine rack.

Buy & Sell

Use the commerce area's directory to search, or browse to find suppliers of telecom and general business products and services. Listings range from contact information to detailed vendor profiles. Search items for auction on commercial sites such as Yahoo B2B.

Web Sites

Use a directory for telecom updates from around the Web and for specially selected telecom Web sites, including useful news sites and tools such as calculators and dictionaries. Browse the directory or search the actual content of the sites using a custom Web search engine.

Events

Look up dates for trade shows and conferences, plus scheduled events such as interactive chats with industry experts.

Training

Read tutorials—brief how-to lessons designed to be completed—and use in-depth interactive training modules being developed now with expert training partners.

Discussions

Join message boards housed in discussion areas moderated by editors of participating trade magazines.

Future expansion for TelecomClick.com

Personalization

Customize your access and combine content and features from throughout the site to create one or more personalized pages.

Related information

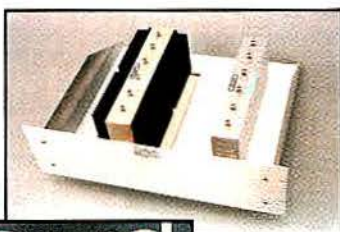
Navigate the site for related information that links to other items categorized for your topic.

Popularity ratings

Find out what's most popular on a site, including the top 10 most-read news headlines and articles; the 10 most popular product listings; and the 10 most-visited vendors.

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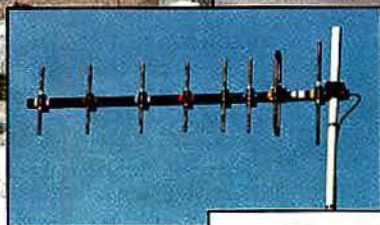
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CORRESPONDENCE: Editorial correspondence should be addressed to P.O. Box 12960, Overland Park, KS 66282-2960. tel. 913-341-1300; fax: 913-967-7250; mrt@intertec.com; www.mrtmag.com.

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Mercy Contreras
Group Publisher
Phone: 720-489-3199, Fax: 720-489-3253
Email: mercy_contreras@intertec.com
5680 Greenwood Plaza Blvd., Suite 100
Englewood, Colorado 80111

LONDON
Stephen Bell
International
Phone: +44 208 286 8889,
Fax: +44 208 286 8898
Email: stephenbell@email.msn.com
P.O. Box 98,
Worcester Park, Surrey. KT4 8WB
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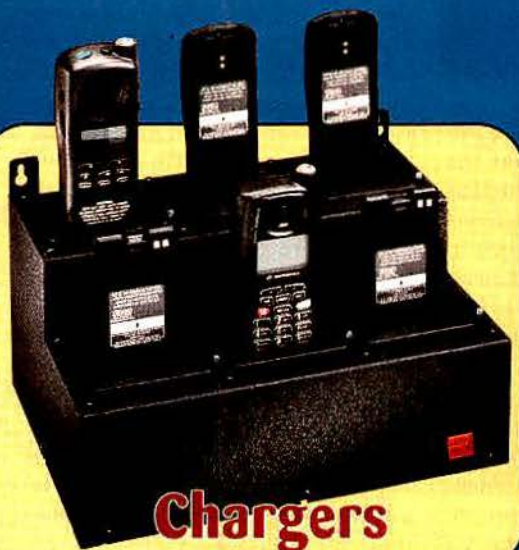
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Circle (7) on Fast Fact Card

FCC: Fix public safety radio interference now

Take a technical problem that could cost lives and property—and make it simple. Then convince federal regulators (or, failing that, lawmakers) to change plans affecting large commercial wireless operators and the quick deposit of billions of dollars into the U.S. Treasury.

That's the task facing state and local administrators responsible for public safety radio communications. To get the job done, they need help from officials such as police and fire chiefs and city managers. They need help from mayors, governors, city council members, county commissioners, state legislators, representatives and senators.

What's the *problem*?

You've read about it in these pages. Public safety radio systems that now use certain frequencies often suffer destructive interference from commercial wireless antenna sites. Police officers and

firefighters sometimes can't communicate when the interference happens. At critical moments, it could cost them their lives; it could cost the lives of those they are sworn to protect; and it could result in property loss that otherwise might be prevented.

"We've had destructive interference on our 800MHz mobile data terminal system. We blame the FCC," said Melvin G. Weimeister, police telecommunications superintendent for the city of Phoenix.

Speaking at the Public Safety Spectrum Protection meeting on Dec. 13, 2000, at Motorola University in Tempe, AZ, Weimeister said that the mistakes visited upon the 800MHz band are about to be visited upon the newly allocated public safety frequencies in the 700MHz band. Frequencies in that band are scheduled to be transferred from TV broadcasters to

public safety radio, commercial wireless and private radio users.

"The Balanced Budget Act of 1997 set up the 700MHz band, and the FCC is not fulfilling the allocation set up by that act. The time to react is now, before we have a 700MHz problem. We need to react before March 2001," Weimeister said.

March 2001 is the postponed date for the FCC to auction the



700MHz commercial wireless frequencies. The problem is that the FCC intends to allow the auction winners to use their frequencies and to place their antenna sites in such a way that will cause destructive interference to public safety radio systems in the 700MHz band similar to what is caused in the 800MHz band.

Public safety radio communications needs to be protected from interference from commercial wireless communications. In a cooperative effort, representatives from the Association of Public Safety Communications Officials—International, the Cellular Telecommunications and Internet Association and Motorola formed a Best Practices Committee to define the interference and to recommend possible solutions. The findings were set to be released on Dec. 15, 2000, a day after this page was to go to press.

Speaking at the spectrum protection meeting, Steve Adler, director

of North American Standards Strategy for Motorola's Commercial, Government and Industrial Solutions Sector, gave a preview of the Best Practices Committee's work.

"What's needed are protection criteria based on adjacent-channel coupled power, regardless of the technology that a commercial wireless company might use, such that the power in the public safety bandwidth is at or below that of the level of an isolation standard," Adler said.

There it is. But participants at the meeting emphasized that public officials, and the FCC itself, won't be swayed by technical details. Here's the way the executive officer of the Phoenix police department, Asst. Chief Mike McCort, put it:

"Changing technology offers an opportunity to improve service. Digital is an improvement, as in Phoenix with MDTs on 800MHz. I don't know all the technology stuff—you push the button and talk. We tried to add base stations and improve antenna placement. Nextel powers up, and we get spots where we can't talk. We don't have much time. We have to talk with Congress, and maybe get them and the FCC to change the way the space is set so the [antennas and frequencies] are not so close. We hope you'll join us in writing to your congressmen and senators. That's all I have to say."

Lend your voice to persuade the FCC to change its plans for 700MHz in a way that protects public safety radio communications. Mel Weimeister can help you to do it if you email him at mweimeis@ci.phoenix.az.us. And if you don't mind, please send me a copy of your written communication to the FCC and public officials on this matter.

Don Bishop

don_bishop@intertec.com

Public safety radio systems that now use certain frequencies often suffer destructive interference from commercial wireless antenna sites.

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Circle (8) on Fast Fact Card

Full disclosure

The Internet is making us soft. If we can't click to find something, it's going to stay hidden. So now that this e-commerce phenomenon is in full swing, I did my best to do my Christmas shopping from home, filling my "shopping cart" with CDs, DVDs and books from Internet re-

tailers. When I couldn't buy it online, though, most manufacturers' sites did offer a list of local bricks-and-mortar stores that would be happy to take my money. Enter your zip code, and a plethora of purchasing options appear.

Although two-way radios and

trunking systems weren't on the top of any of my family member's Christmas lists, I started to wonder, "If I want to find my local radio dealer, how do I do it online?" I guess I could pick up the Yellow Pages and flip to "Radios-Dealers," but come on, this is the 21st century. Phone books are *sooo* 1999.

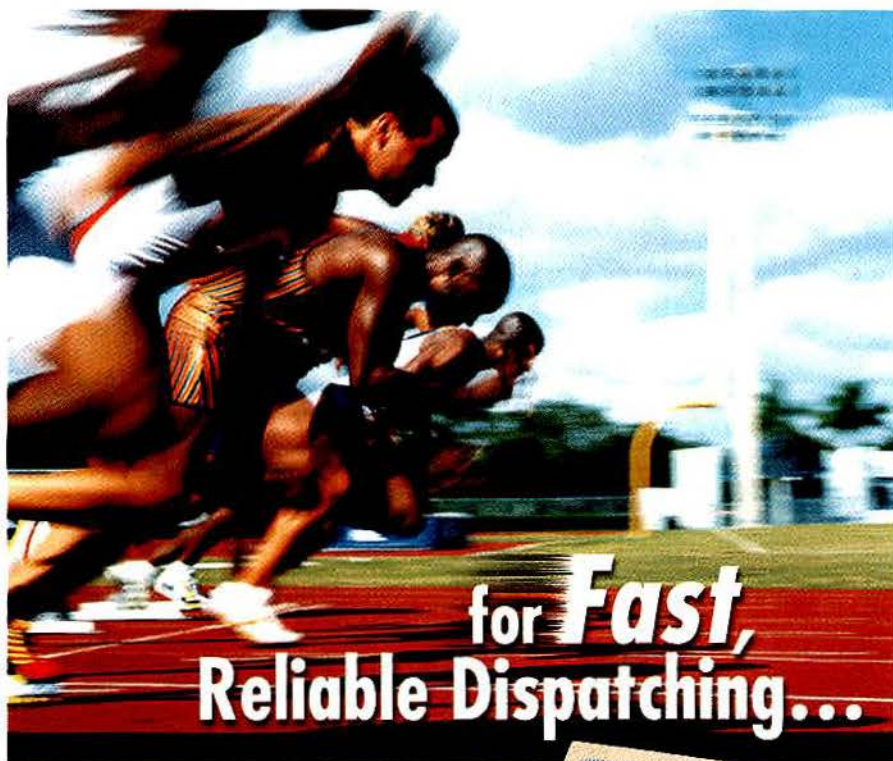
After a quick perusal of the Web sites of Motorola, Com-Net Ericsson and Kenwood, it becomes quite apparent that the radio industry hasn't reached this level of Internet sophistication. Motorola's "dealer locator" page offers a toll-free number for dealer information, which is a small step in the right direction. Com-Net's site has links to local district sales managers, and it plans to offer access to dealer lists in the near future. Kenwood's site, on the other hand, will display a map of local audio component dealers, but as far as LMR dealers are concerned, no dice.

Manufacturers hold their dealer networks close to their chests—the prospect of losing one to the competition is enough to keep executives up nights—so the argument could be made that no one wants to make such information so easy to find. But the real losers in this scenario are the dealers themselves. At a time when the usefulness of the Internet as an informational tool is at an all-time high, dealers stand to lose a substantial foothold in the new economy if their manufacturers deny them the exposure the Web can offer. Motorola's Web site is a little easier to find than Bob's Radios and Repeaters', so the big boys owe it to their dealers to rely on some good old-fashioned name-brand recognition.



Matthew Halverson
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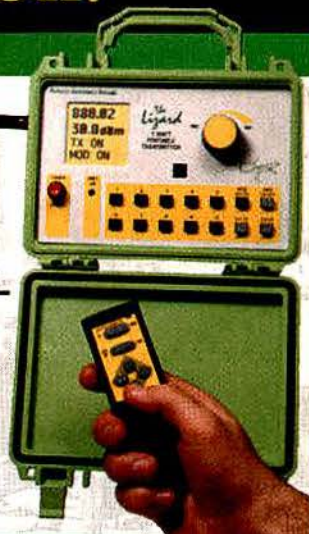


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'2001: A Space Odyssey'

By Robert H. Schwaninger Jr.

It's here. That infamous year that was saluted on film with the fantasies of Arthur C. Clarke and Stanley Kubrick: tool-wielding monkeys, mad computers, space cowboys and a big monolith that could neither be climbed nor penetrated. Speaking of the FCC ... (rim shot).

This is the first baby step of that century that everybody's been talking about for what seems like—

vented the transistor or the lady who penned "Happy Birthday"?

Deluged by historical measurements, we have ranked and rated just about everyone from Attila the Hun to the Pillsbury Dough Boy. And what does it mean? It means we're *done* looking back. It's time to look *forward*. We've put that tired, old century to bed along with its beat-up millennium, and it's time to look to the future to determine what we think might happen.

Now, there is no way that I, sitting alone, can hope to read every tea leaf in the cup. Despite what my firm's brochure says, I am neither all-knowing nor all-seeing. Those adjectives are reserved for my wife. So, I'm going to need some help from the readers. Polish up your crystal balls and answer these questions. *MRT* will publish the answers, and we will see just how good you are at predicting the future.

For example, will there be a new release of federal government spectrum to feed the appetite of the already "over-banded" public corporations that sprout like morning mushrooms at every sound of a gavel at the FCC? Will NTT and AT&T get together to deliver a viable wireless Internet service?

If you're into people, how about predicting one of these? Will we see Reed Hundt emerging again in an-

other government job where he can continue to find ways to eviscerate the antitrust laws? Will Bill Kennard stay at his post, or bolt for private industry? And how many commissioners will be left after a new administration is installed? Only two have unfulfilled terms.

Into Wall Street? There's plenty to speculate about there, too. For example, will another major paging company file one of those "chapter" things? Will Nextel's stock turn

the corner and begin a slow rise, or will it continue to hover in the \$28-\$35 range? Will MCI Worldcom continue to shudder under its own weight?

Will AT&T ÷ 4 = SUCCESS?

There's no end to the number and kinds of events that your crystal ball might conjure. Who knows what you will see when the smoke clears? Frankly, your guess is probably about as good as anyone else's.

Here are a few predictions *I'm* willing to make. See if you agree.

During 2001, the following *will* or *will not* happen:

1. Not one lease will be entered into between a 700MHz band manager and another living soul that will result in the construction of a single facility.
2. The FCC will have at least one auction overturned by the courts, preferably the 800MHz SMR auction.
3. The price of a digital television receiver will fall to around \$500 as the novelty comes closer to reality, and the airwaves will be filled with ads urging people to buy them as Father's Day gifts.
4. Some company will try to become a mini-Nextel by attempting to consolidate UHF trunking channels and facilities.
5. There will be a new feeding frenzy for 900MHz trunked channels as speculators move onto that band to play "Let's Make A Deal."
6. The tower industry will see the emergence of a new, important player.
7. In a combined operation, OSHA and the FCC Enforcement Bureau will choose some pigeon to fine the bezookies out of for violation of the RF exposure rules and standards.
8. Local number portability will continue to be more theory than reality because none of the LECs can figure out how to make a buck out of it.

OK. That was eight predictions, and I didn't even break a sweat.

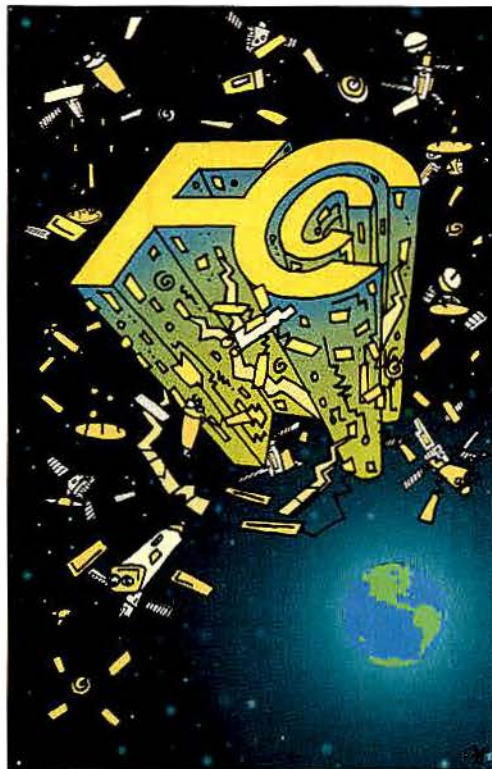


Illustration by John Hayes

a century. Over the last two years, the media have focused on the best and worst of the last 100 years or 1,000 years. Was Hitler a nastier guy than Stalin? Was Einstein more important than Ray Kroc? Who got richer, the guy who in-

Schwaninger, *MRT's* regulatory consultant, is the principal in the law firm of Schwaninger & Associates, Washington, which is counsel to Small Business in Telecommunications. Schwaninger is also a member of the Radio Club of America.



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SS-25	20	25	2 1/4 x 7 x 9 1/4	4.2
SS-30	25	30	3 1/4 x 7 x 9 1/4	5.0

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WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3 1/2 x 19 x 9 1/4	6.5
SRM-30	25	30	3 1/2 x 19 x 9 1/4	7.0

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
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SRM-30A-2	25	30	3 1/2 x 19 x 9 1/4	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3 1/2 x 19 x 9 1/4	10.5
SRM-30M-2	25	30	3 1/2 x 19 x 9 1/4	11.0

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CIRCLE (13) ON FAST FACT CARD

Just let your mind wander from the possible to the probable and back again. Suddenly, you look like Cleo at "the Psychic Hotline." Mind you, these predictions are a little on the staid side. When you're ready for the advanced version of our game, you can try some like these:

- ☐ By the end of the year there will be a new rock band on the charts called "Pregnant Chad."
- ☐ Archeologists will uncover an ancient tablet buried near the pyramids, which, when translated reads, "Only the Pharaoh owns the radio spectrum."
- ☐ At least one urban parachuter will attempt to jump from a tower in a videotaped stunt. Unfortunately, the jumper will choose a hot AM tower.
- ☐ The political-correctness police will move in on the industry, outlawing the use of the word "yagi." Their leader, Wanda Butzwright, will be quoted as saying, "It just *sounds dirty*."

Now that I've got you hooked, let's see what you think about one *real* question. With the combined knowledge and wisdom of the *MRT* readership, we should get a pretty good idea what to expect. Email us at mrt@intertec.com between Jan. 1 and Jan. 31 and record your "vote" about this one. We'll publish the results on the *MRT* Web site, www.mrtmag.com, as soon as they are tallied, and we'll also publish them in this column in the March issue of *MRT*.

Choose the event most likely to happen in 2001:

- A. Additional spectrum below 1,000MHz will be released by the federal government for use by private industry.
- B. The FCC will adopt rules creating "band managers" for all of the shared VHF and UHF private radio spectrum.
- C. The FCC's Universal License System will crash, leaving the public without access for as long as two weeks.

Sometime in 2001 you'll be able to record your responses to other questions I will pose here directly on the Web site. We'll look forward to your views. Meanwhile, have a prosperous New Year. ■

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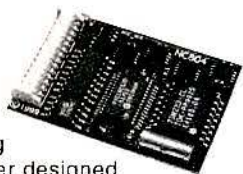
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Public Safety '10-2'

Commercial service providers— Keep an eye on the basic plan

By David O. Dunford

Commercial service providers include paging carriers, trunked radio system operators (the only *real* SMRs left) and, of course, Nextel—the firm we still love to hate. The key to success for public safety communications managers is keeping the available communications services and products in a balance that is determined by the unique needs of each individual agency. Private radio has enjoyed a long success in public safety for its benefits that are “intuitively obvious to the casual observer” and based on one simple (sort of) fact: Private radio is the baseline of communications service on which an agency can certainly, definitely, totally and consistently rely. Carrier services are convenient, possibly even useful—occasionally even cost-effective (a government malapropism)—but suspected of never *really* being ultimately reliable.

It's this doubt (and occasional mistrust) about a profit-driven technical venture that causes concern within the public safety community. The truth is that the needs of public safety often merge well with carrier services. Because “regular” carrier customers operate with, more or less, statistically averaged channel and feature usage, the interleaved public safety “emergency” traffic receives perfectly adequate handling. Only the affected, service-consuming agency can determine the cost-benefit value of the service—but subscriptions are steadily growing.

So why not completely “privatize” a department's communications system? To be sure, the direct costs and regulatory impediments of owning and maintaining a private system are rising. We have seen

that user equipment for digital network-based systems can cost \$4,500 for each portable or mobile radio. About the only cost *not* rising is for conventional radio sets.

A financial case can also be readily made for privatization. The only conclusion I have drawn is that system managers and Radioman still stubbornly rely on the basic premise and stability of system ownership and control. In most cases, the systems aren't even fancy. And even the fancy ones aren't modern by consumer standards: no wireless Internet, no duplex communications or caller ID (typically not even an interconnect) and no wide-area roaming. But the systems do occupy a place in the spectrum for the “conduct of official activities of the applicant,” typically to the exclusion of non-essential traffic. So even with an ironclad service contract, we still trust ourselves more than service providers.

What's the best way for public safety to continue to provide adequate system services for itself? Public safety managers need to meet regularly with Radioman (either in-house or private shop staffs) and discuss, frankly and coldly, the facts and options of constantly evolving local needs. While turning an eye to future needs, don't forget the basic elements of your communications services plan. Take a moment and schedule the meeting today. ■

Dunford, MRT's public safety consultant, is technical services consultant for the Lenexa, KS, police department. He is a member of the Association of Public-Safety Communications Officials-International. [You can email Dunford at mrt@intertec.com.]

P25

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Is your two-way radio system *balanced*?

The base station noise floor, vehicle noise and ambient noise in the service area can all contribute to throwing a radio system out of balance. Here's how to fix it.

By Patrick E. Buller

In a balanced two-way radio system, the talk-out power closely matches the talk-in power. If you are like most radio users, your system is far from balanced, to the expense of other radio users who share the same site.

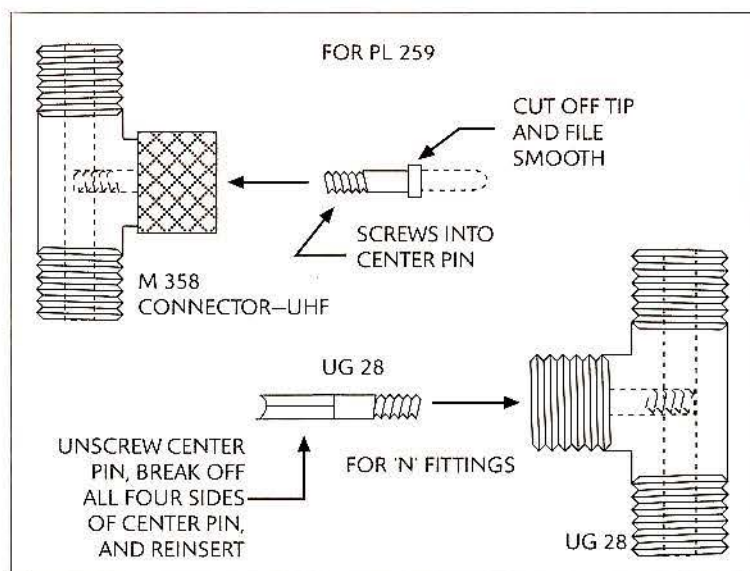
Initially, radio had merit for the police departments by notifying the cops via "the radio waves." Some of you older folks will recall tuning an AM broadcast radio to the

Motorola or GE VHF lowband or highband base using a pair of Eimac or RCA 4-125 transmitting tubes with 250W to 300W output to a unity-gain ground-plane antenna. The mobile was probably a Motorola 5V with a healthy 15W output power using a roof-mounted unity-gain antenna for 150MHz, or a Master Mobile spring base whip for 30MHz-49MHz. If the budget allowed, one might have had a Motorola 30D or a

GE Pre-Progress line. In any case, it was hard to get more than 50W reliably using dynamotors to generate high voltage.

At the base station

The *site noise floor* is easily measured and should be in the records of the station. This procedure, covered in Motorola, GE and RCA tech manuals in years past may be unfamiliar to new technicians. The most simple test appliance for the procedure is an isolated connection to the coax cable—one that will *not* disturb the normal operation of the transmission line. This *isotee* is fabricated by eliminating the direct connection of one of the points of a coaxial tee connector. Removing this connection as shown in the diagram at the left allows some signal to enter the cable without double-terminating the cable. (When you make an isotee, it is suggested that it be *painted* so it won't be confused with an unmodified one.) The diagram on page PS4 shows the connection of a signal generator to the base station with an isotee for noise floor measurement. A directional coupler is a good device for this application and is preferred. However, the isotee is inexpensive and can be fabricated on site if the directional coupler is left in the shop.



Fabricating a coax isotee from standard connectors.

high end of the band, near 1.7MHz, to hear police calls. They were usually one-way broadcasts. Police were expected to respond to the calls received. Some time later, in the late 1940s and early 1950s, two-way radios were more readily available for public safety communications. Typically it would be a

ratio of 20:1. Essentially, we are where we were 50 years ago. What have we gained?

An exception to this example was the combination of a 100W mobile and a 100W base station. Even in that case, are you still balanced? Let's look at a few concepts that have often gone unnoticed.

Buller is a special projects engineer for Tacoma Power, Tacoma, WA. For many years he served as an electronics design engineer for the Washington State Patrol. He is a member of IEEE, NARTE, APCO and ARRL, and he is a Fellow of the Radio Club of America. His email address is W7rqt@msn.com.

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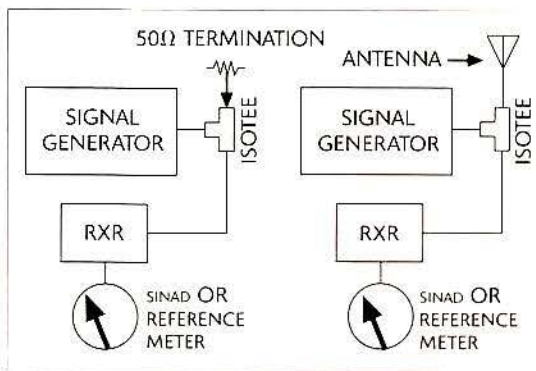
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Connection for noise floor measurement.

Connect the isotee to the receiver input, and connect the other end with the appropriate termination, usually 50Ω. The isolated port is connected to the signal source. Then adjust the signal generator to some reference point, usually 20dB quieting or 12dB SINAD for the analog world. Note the output level of the signal generator in decibels above

one milliwatt. Remove the termination and connect the base station antenna to this port. Adjust the signal generator to a level that gives the same previous reference point, 20dB or 12dB SINAD. The difference between the two signal generator levels is the site noise. If you don't see any change, you are fortunate. If the readings are from 6dB to 30dB, you are not alone—your station is somewhat "deaf." A good practice is to take these measurements at least every six months and keep a log on site. It will answer lots of questions later when your coverage seems to have evaporated for no apparent reason.

There are various sources of noise, including: remote network terminals, (i.e. trunking computers), synthesized equipment (see below); battery chargers that use silicon-controlled rectifiers for voltage regulation; switching power supplies; commercial cell/PCS transmitters, adjacent channels; T-1

modems connected to the cell/PCS station; tower strobe light equipment; and most often, FM and TV transmitters running high power.

The mobile

One major and often overlooked item is the antenna placement on the vehicle. The optimum location on a car is the roof. However, as seen in the photo on page PS6, other appliances installed nearby not only affect the antenna's performance but often are the source of noise when operating. The antennas mounted as shown on page PS8 not only have higher VSWR, their radiation is limited to the direction having the most metal. Any of these installations should be checked for desense.

To measure desense of a vehicle, do not use the isotee method. Extra cabling for instrumentation will cause errors. Park the vehicle in a clear spot, engine off, with only the

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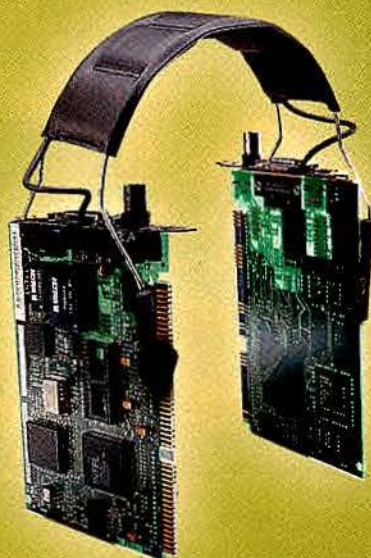
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radio on. Place a signal generator about 50 to 100 feet away, on-frequency with the correct deviation and connected to a short antenna. (The antenna that came with the generator will do.) Apply enough signal to establish a reference point, such as where the squelch

opens, and note the RF signal generated. Now start the engine, turn on all appliances, light bar, air conditioner, fans and anything else that is normally used. Note the increased signal generator level required to achieve the same reference point. If the signal generator's



Other appliances can become noise sources affecting antenna performance.

output was increased to 2.5dB or 3.5dB, you're not alone. This additional noise is often overlooked. Any desense greater than 3dB, however, should be corrected.

The surroundings

Some of the problems with ambient noise at the receiver's location arise when the area itself is extremely noisy. Faulty neon signs, concentration of computers, digital telephones, ignition noise of a nearby vehicle and (in the case of portables), noise generated by the user's clothing can cause extra noise. Although these noise sources are always present, the portable/mobile is usually not near any one of them for a long period of time. In any case, ambient noise limits reception. If this affects the only location in which you need coverage, then the system does need to be balanced in your favor.

Instrumentation

Attempting to use a digital spectrum analyzer to find noise and/or



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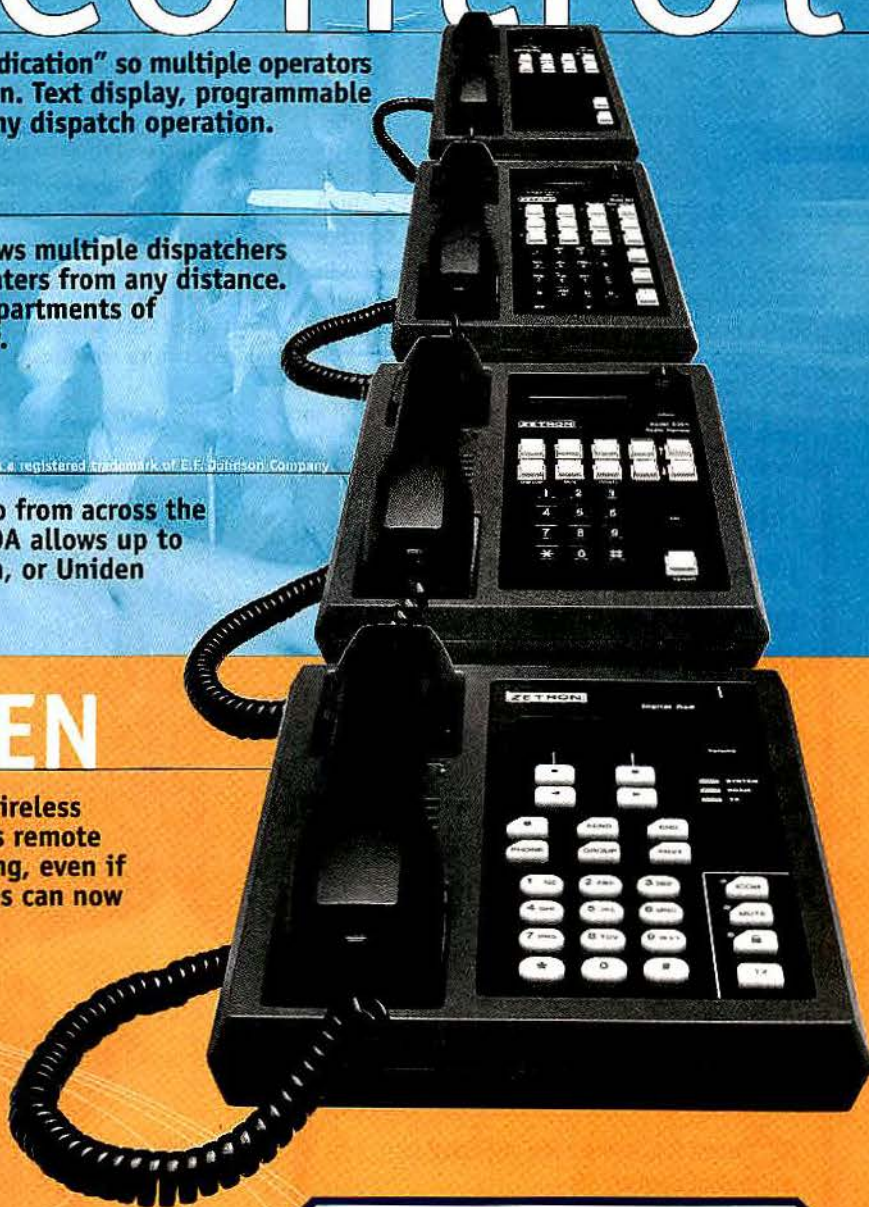
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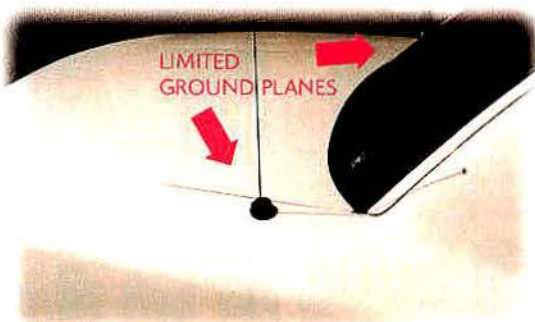
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An installation that should be checked for desense.

noise floor is a "no-win" situation. Noise is generally ignored by digital processing, which is one of its strong points. One case involved a PCS operation interfering with a lowband base station. The PCS engineers set up a digital spectrum analyzer and found no noise. They ultimately had to rely on the

lowband base station's receiver as their troubleshooting monitor. The problem was eventually fixed, but their expensive digital spectrum analyzer showed no change. Noise investigation needs to be conducted in the AM mode if possible.

Synthesizers

Frequency synthesizers for frequency control are used in signal generators, receivers and transmitters. Although they offer frequency agility, they also generate noise. For example, a current-model mobile transceiver was undergoing an intermodulation test to see if it performed within published specifications. The test was conducted using several Cushman service monitors as signal sources, and the receiver failed the test. The receiver did pass the test when older Measurements Corp. signal generators were used. These old

devices have oscillators that generate RF on-frequency, have little harmonic content and have virtually no noise. The Cushman service monitors are synthesized sources that not only generate the "on-frequency" signal but have spurs close to the desired signal. (For the curious, check the Cushman with an analog spectrum analyzer.)

For transmitters, synthesizers seem to be the industry standard today. However, they also generate noise as a byproduct of operation. Case in point, one of the major brands of base stations was recently installed, replacing an older crystal-controlled radio. Two mountaintop base stations on adjacent channels just 30 miles away immediately experienced noise from this new product. The reason: This product is nothing more than a high-power, synthesized signal source with no

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tuned circuits anywhere in the transmitter line-up. The only tuned circuits used in this product are in the receiver. This manufacturer has chosen a fast AFC loop for the radio to "come up" on-frequency quickly. Other radios on the market have a slower AFC response time, which reduces the amount of

sideband noise.

Some of the cellular and PCS telephones operate in the milliwatt range, but the cell site transmitters are in the hundreds of watts—not a balanced situation, for sure. The real problem here is that when all the cell site transmitters are on the air, they can radiate near the kilo-

watt power level. It is impossible to receive anything if one needs reception nearby. Many 800MHz public safety systems appear to go deaf when a cell system is activated nearby—a classic case of an unbalanced system where there is more transmitter power than necessary. The Amateur Radio Rules and Regulations clearly instruct operators "to use no more power than absolutely necessary." Perhaps that concept should be implemented in the commercial world also.

Most two-way radio coverage problems are due to the high level of site noise at the base station site, often caused by high power levels, like those used by paging transmitters or many accrued transmitters. Also, the performance of a receiver is hurt when subjected to synthesized RF sources. The newer products create more noise than the older products they're replacing. The real question is why these base stations are being forced on the user when the base station's life will probably be at a fixed location and only on one frequency.

Why is high power tolerated when the site noise prevents reception for portables and low-power radios? Isn't it time we reduced the transmitter power to something like 25W–35W? Why are all of the users on a common site forced to have additional noise as neighbors? To build a transmitter that is "one size fits all" might be a good sales strategy, but the increased noise limits the number of radios that can exist on a site.

If the industry is having problems now with wideband, how can it meet the 12.5kHz and 6.25kHz spacing if the synthesized noise problem is not corrected?

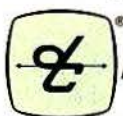
It is time we asked the radio manufacturers to keep the transmitter noise at least equal to the older crystal radios. Just because we can adjust the transmitter to maximum output of 125W–150W, is it necessary to do so? We should attempt to balance the RF environment now.

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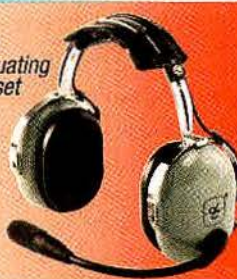
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Elucidations and explorations

By Harold Kinley

The September 2000 "Technically Speaking" column, on transmitter noise and receiver desense, requires some clarification, based on feedback from an experienced reader. His comments provide additional useful insights to topics covered in the past few months as well. This month we also have a question from a reader regarding contact corrosion problems with paging transmitters. If you have comments, questions, suggestions or information that you feel might benefit the readership of *MRT*, please feel free to send them to me at the mailing address or email address listed below, or submit them via the *MRT* Web site,

covered in the September 2000 issue by William J. Kessler, P.E. Kessler has more than 40 years of experience in electronic and communications engineering, including university-level teaching, research projects, and extensive consulting engineering. He is a principal in Kessler and Gehman Associates, Telecommunications Consulting Engineers. His feedback concerns the measurement and/or calculation of isolation between antennas. You may wish to refer back to the figures used in the September column, which appeared on pages 18 and 20.

Kessler writes (*text edited for space; figures are reprinted on page 20.—Ed.*):

"I noticed the following omission regarding the application of the free-space isolation formula:

$$A = 32.3 + 20 \log D + 20 \log F$$

"This formula is applicable only when both antennas are located well inside the Fraunhofer region of each antenna. The Fraunhofer region, (far field region) is that region where the propagated wave front from one antenna to the other antenna is essentially a plane wave.

"By contrast, the Fresnel region (near field region) is where the propagated wave front adjacent to the receiving antenna is spherical. This can result in an unacceptable phase variation of the

signal at the receiving antenna due to radiation of the signal from different parts of the transmitting antenna. The line of demarcation between the near field and far field region is rather diffuse. However, most engineers have accepted the demarcation distance (d) to be equal to or greater than twice the dimension (D) of the larger antenna

squared divided by the operating wavelength (λ). That is:

$$d \geq \frac{2D^2}{\lambda}$$

"Therefore, when referring to the application of the free-space attenuation formula, the restriction that the distance separating the two antennas should be equal to, or greater than, the value of d as given in the previous equation.

"Your Figure 1 example is correct in that the two 6dB gain antennas operating at 150MHz are 500 feet apart. A 6dB-gain antenna at 150MHz ($\lambda = 6.56$ feet) would be at least 20 feet long. Therefore, according to the free-space propagation formula, the minimum separation distance would be:

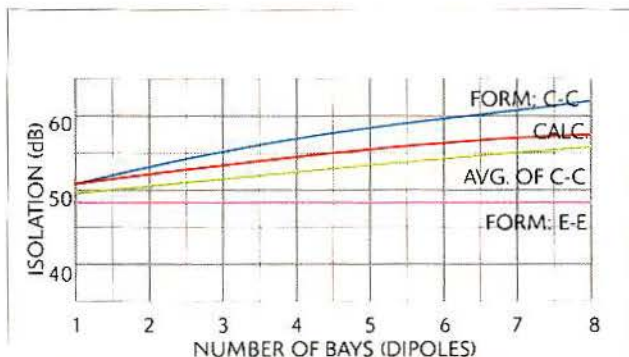
$$d = \frac{2D^2}{\lambda} = \frac{2(20^2)}{6.56} = \frac{800}{6.56} = 122 \text{ ft.}$$

"Clearly, the 500-foot spacing in your example in Figure 1 exceeds the minimum required horizontal separation between the antennas.

"With regard to Figure 2, which illustrates the vertical separation (V) between two gain antennas as measured from center-to-center, not all engineers are in agreement on how the spacing should be measured. Some engineers measure the separation distance between the top of the lower radiating element and the bottom of the upper radiating element. For antennas exhibiting gains of 6dB to 9dB, the substitution of the smaller distance into the formula

$$A = 28 + 40 \log \left(\frac{FV}{984} \right)$$

would yield a lower isolation



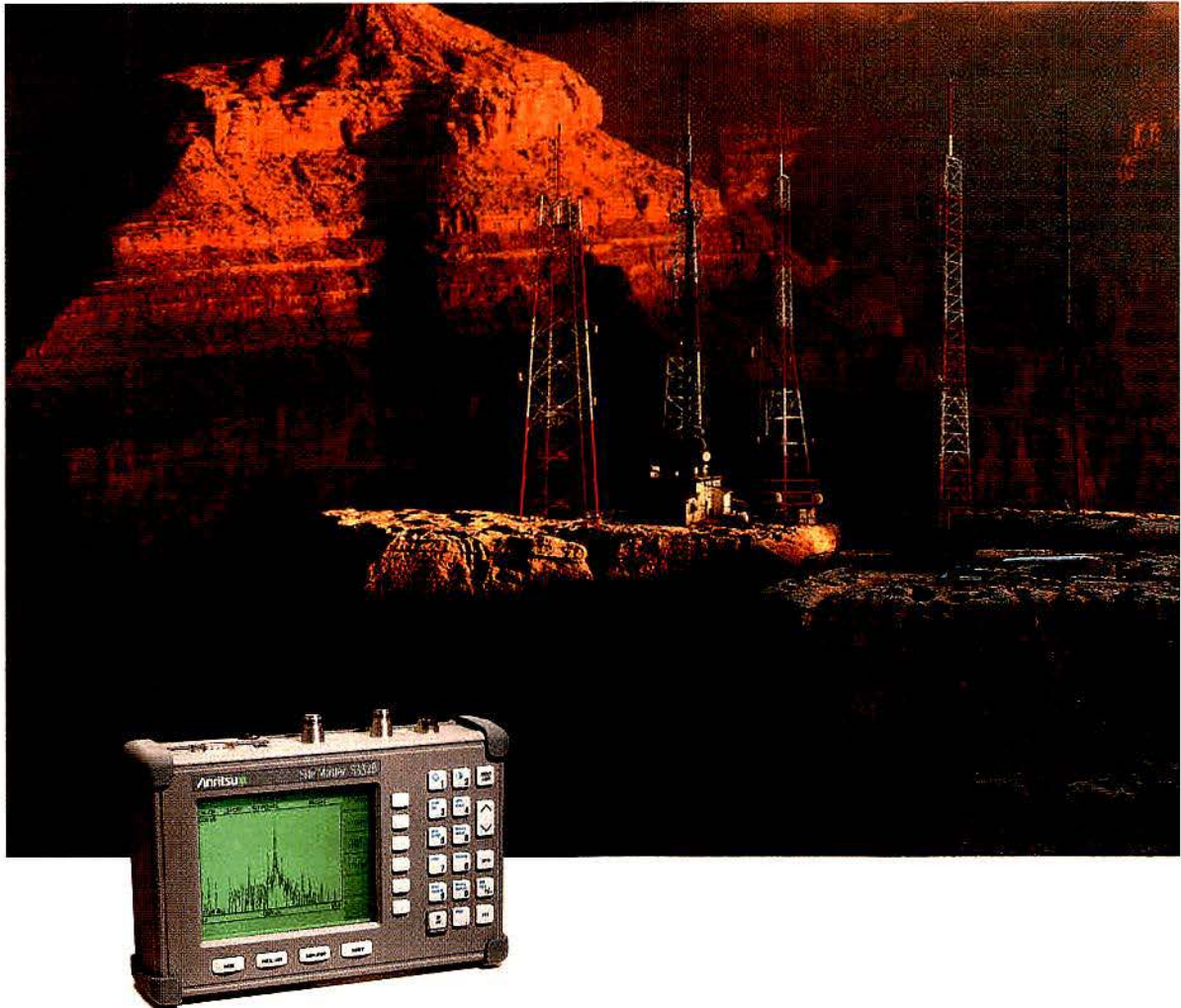
This shows the isolation between a single dipole and a dipole array of as many as eight dipoles. The spacing between the top of the single lower dipole and the bottom of the upper dipole of the array is 20 feet. The frequency is 160MHz. The top curve is a result of applying the formula (see text) by measuring the separation from center-to-center. The bottom curve is obtained by applying the same formula, measuring the distance from adjacent ends of the antennas. The red curve is a calculated value based on how much power is transferred from each of the eight elements of the upper antenna into the lower dipole. The green line is an average of the isolations obtained by measuring vertical separations center-to-center and end-to-end.

www.mrtmag.com. Also, if you have found a good Web site that might offer tutorials or calculation tools that would benefit readers of *MRT*, please pass them along to me. The good leads will be published on the *MRT* Web site or in future columns.

First up is an excellent response to some of the topics

Contributing editor Kinley, *MRT's* technical consultant and a certified electronics technician, is regional communications manager, South Carolina Forestry Commission, Spartanburg, SC. He is the author of *Standard Radio Communications Manual, with Instrumentation and Testing Techniques*, which is available for direct purchase. Write to 204 Tanglewyld Drive, Spartanburg, SC 29301. Kinley's email address is hkinley@home.com.

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between the antennas than the substitution of the larger center-to-center measure.

Perhaps these engineers simply want to play it safe and use the separation measure that yields the lowest isolation figure. The problem I see with the end-to-end

separation measure is that it yields an isolation figure that is independent of the size or gain of the vertically spaced antennas. On the other hand, I have reason to believe that the isolation figure calculated using the center-to-center separation distance between high-gain antennas

yields a calculated attenuation (isolation) that is too high.

"I have calculated the isolation between a single dipole and a gain antenna (with as many as eight dipoles) by separately calculating the power coupled into the single dipole from each of the dipole arrays, ranging from two dipoles to eight dipoles and summing the result. In each case, the resulting isolation between the antennas falls between the calculated values for the end-to-end and the center-to-center separation measurement. As a result, I now calculate the isolation using the formula for both the end-to-end and center-to-center measures and use the average of the two.

"Although I agree with your statement in the Figure 3 caption that it is better to measure the isolation between two antennas that are spaced both vertically and



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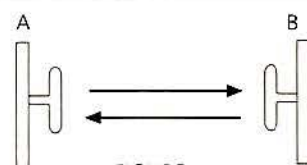


FIGURE 1

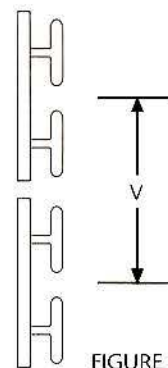


FIGURE 2

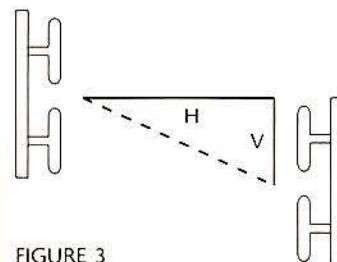


FIGURE 3

Figures 1, 2 and 3 from the September 'Technically Speaking' column.

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horizontally, there is a formula for calculating the isolation for this case, where:

S = slant isolation.

V = vertical isolation.

H = horizontal isolation.

θ = angle in degrees as defined in drawing.

"The formula appears reasonable because for terminal values of θ it reverts to the horizontal separation formula for $\theta = 0^\circ$ and the vertical separation formula when $\theta = 90^\circ$."

Kessler also included a graph comparing different methods of determining the isolation between

collinear antennas or arrays. The graph is shown on page 18.

The next comment comes from a reader whose question is printed here in hopes of triggering some feedback with suggestions and "what you do" to deal with a common problem. Here is his question:

"We are a paging company that has about 2,000 Motorola Nucleus transmitters throughout the USA. The Nucleus has an external battery that keeps the exciter and controller running when there is a power failure. The printed circuit board contacts on the power supply that provide the charging for the external batteries are gold-plated and the connector is tinned. We have been having lots of problems with corrosion and reduction with that connection. The connection becomes a high resistance. The batteries charge OK, but when the power fails and the controller needs the 2A to run, the resistance causes the station to reset.

"Someone suggested we use Stabilant 22A to eliminate the corrosion problem. They claimed it worked great when they worked for Motorola. Motorola will not dig into this because they discontinued the product. Do you have any suggestions on how to deal with the corrosion problems?"

OK readers, if you have any suggestions that might help a fellow reader with this problem, please email me at the addresses given, and I will pass the information along to the readership in a future column.

You are always invited to use this column as a forum to pass along information, ideas and suggestions that might benefit your fellow technicians working in the land mobile radio field.

Until next time—*stay tuned!* ■

You can access Harold Kinley's email on the www.mrtmag.com Web site. Under the heading "About the Magazine," click "Contact the Editors."

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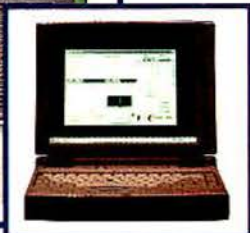
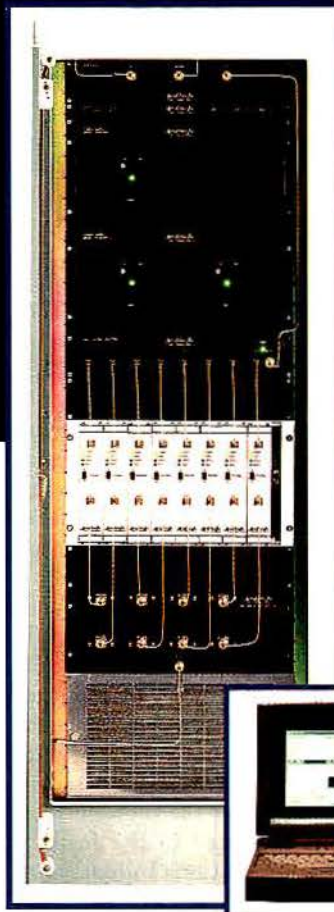
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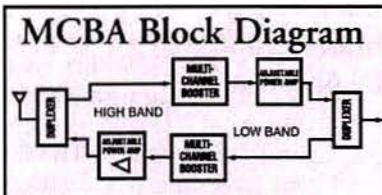
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Coming to America: TETRA - one way or another

The TDMA technology from the other side of the pond is poised to gain a foothold in the American public safety communications market.

By Don Bishop

Born in Europe, the digital technology known as TETRA is gaining support for its immigration to the North American public safety, utility and industrial radio communications markets.

Siemens, Alcatel, Racal, Nokia and Motorola, among other manufacturers, have developed relevant radio communications technologies protected by various patents, copyrights and trademarks (intellectual property rights). They brought their technologies together to develop Terrestrial Trunked Radio, a four-slot, time-domain, multiple-access modulation with trunking,

encryption and multiple-site networking capability, and a constellation of features.

TETRA's origin

Originally, TETRA helped to satisfy a European requirement (under the Schengen Treaty) for trans-border communications among public safety agencies, motor transport companies and other commercial interests. Manufacturers that provide TETRA products have signed a common agreement: the TETRA IPR Undertaking. The agreement complies with European Telecommunications

Standards Institute patent policies that require signatories to license essential IPR to one another, making the manufacture and distribution of TETRA products possible and allowing the signatories to use the TETRA name and trademark.

TETRA development took advantage not only of multiple manufacturers' IPR, but also of a virtually European-wide reallocation of spectrum from 380MHz to 400MHz. Military users whose governments belong to the North Atlantic Treaty Organization initially yielded the frequencies. Other nations have followed suit. TETRA has since been adapted for other frequency bands.

IPR cross-licensing among manufacturers for the European market was a "given" under the ETSI common agreement. Additionally, manufacturers have licensed their IPR to one another in a way that allows the sale of TETRA equipment in Asia, Australia and the Pacific.

Not every holder of essential IPR in North America has granted licenses, though. Non-disclosure agreements, company policies and the privacy of commercial contracts often cloak IPR licensing details. Even so, TETRA proponents name Motorola as the sole reluctant IPR-holder.

"I would expect them to say that—to cast Motorola as the bad guy," said Patricia Sturmon, Motorola's senior

manager of public relations. "If I were them, I would use the same tactic. The truth is, Motorola is not the only company that has to give an IPR license for TETRA to be sold in North America."

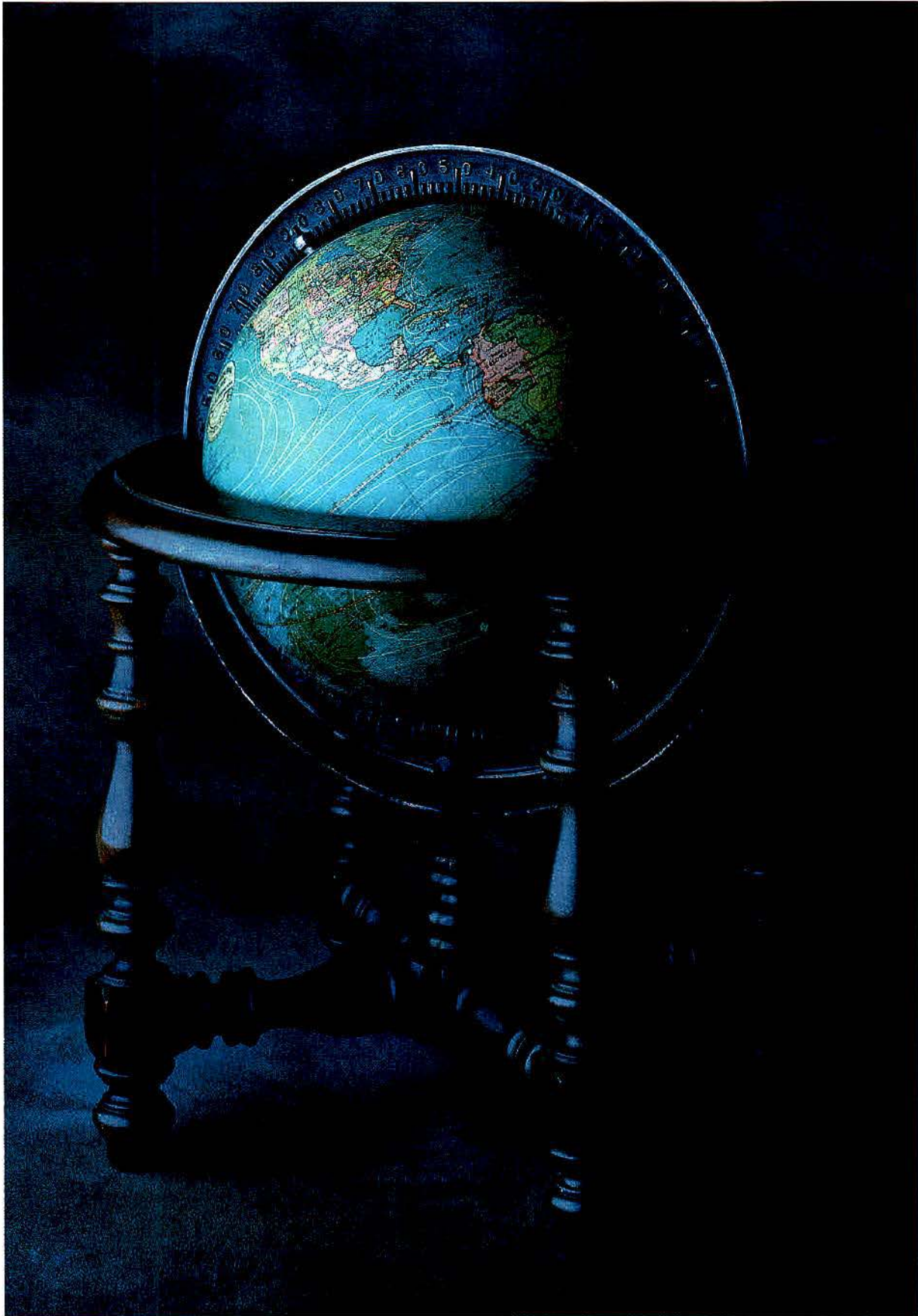
Standards

TETRA is detailed in a digital radio standard adopted by ETSI, which has its headquarters in Sophia Antipolis, France. ETSI literature describes the institute as "a non-profit-making organization whose mission is to produce the telecommunications standards that will be used for decades to come throughout Europe and beyond."

Project 25, a process begun in 1989 by the Association of Public Safety Communications Officials-International to define an interoperable U.S. technology for public safety digital radio, accepted a frequency-division, multiple-access technology that has been adopted in the form of Telecommunications Industry Association and American National Standards Institute standards, supplemented by TIA Technical System Bulletins.

TIA describes itself as "a full-service national trade organization with membership of more than 1,000 large and small companies that provide communications and information technology products, systems, distribution services and

"I would expect them to do that—to cast Motorola as the bad guy. The truth is, Motorola is not the only company that has to give an IPR license for TETRA to be sold in North America."



professional services in the United States and around the world."TIA's stated mission is to represent "providers of communications and information technology products and services for the global marketplace through its core competencies in standards development, domestic and international advocacy, as well as market development and trade promotion programs."

TETRA proponents contend that

contributor to the ETSI TETRA standard in Europe and the TIA Project 25 standard in the United States. Motorola has agreed to license its essential IPR in each of these regions under fair and reasonable terms and conditions for the standards developed."

The ETSI IPR policy seems to require IPR licensing under fair, reasonable and non-discriminatory terms. Some manufacturers view regional restrictions as discrimination.

The market

Motorola contends that TETRA was developed to meet European user needs and that those needs differ from those of North American users. For example, population densities are higher in Europe, and police departments tend to be larger—characteristics that TDMA technology might serve better. FDMA technology embodied in Project 25 Phase I adapts well to large agencies that need a lot of channels and to small agencies that may need only one channel.

Which is better, TDMA or FDMA? The answer involves many factors, including licensed power, terrain or topographical conditions, environmental conditions, system size, location, complexity, coverage requirements, available transmitter sites, direct-mode requirements, simulcast requirements and multicast requirements. Although these factors are simple and easy to understand, they do not convey how complex the decision may become. Additional factors also might affect the selection of well-designed systems. At some point, though, a TDMA system might become more efficient than an FDMA system and vice versa.

Motorola has recognized that interest in TETRA exists in North America, especially in areas with high population density, such as New York and New Jersey. The company is addressing that interest through the standards committee.

"We do know that some customers are interested in TETRA. Yet,

is interoperability important? Are the rural areas important?" Sturmon said.

A group that describes itself as "an association created to promote, discuss and enhance TETRA technology in North America," the North American TETRA Forum (www.tetraforum.org), is publicizing, if not stimulating, interest in TETRA among potential U.S. and Canadian customers. Its member list includes Nokia, Simoco, Com-Net Ericsson, Marconi Communications, Rohde & Schwarz and Kenwood. NATF conducted a workshop on Aug. 18, 2000, in Boston following the APCO convention. The workshop included discussions of the standards process and TETRA technology, presentations by users of TETRA systems in other countries, and product displays.

Also, Com-Net Ericsson has paired with Marconi to distribute Marconi's TETRA portfolio, including infrastructure, mobiles and portables for



TETRA is on the brink of penetrating the North American market, but it must be approved by certain manufacturers. All holders of essential IPR in North America must grant licenses first.

ETSI has a global reach and that TETRA MoU signatories should license essential TETRA IPR in North America. Motorola, either as the sole North American IPR hold-out or as the most visible of several holdouts, wants American users to demonstrate an appetite for TETRA before it will license its IPR. A demonstration acceptable to Motorola would be the adoption of TETRA as a TIA standard.

"Motorola supports its customers and user-driven standards throughout the world," a statement from Motorola reads. "Motorola has been a major supporter of and

Jerry Briggs

As chairman of the United Telecom Council's utility wireless applications task force, Jerry Briggs said that the promise of interoperability motivates UTC to consider TETRA. Briggs is also a UTC board member and a transport technology manager for TXU, an electric and gas utility in Dallas.

"TETRA offers another choice to our members who thus far have been limited to proprietary systems from the 'big three,'" Briggs said, referring to Motorola, Com-Net Ericsson and EF Johnson. "We are not saying that TETRA is better technologically, just that we want the additional choice."

Briggs also commented on the issue of interoperability as it relates to second-sourcing.

"TETRA is an open architecture with true interoperability. Any vendor's terminal units will operate on any other vendor's system. This introduces a degree of competition that we have not experienced in the United States. It will result in lower costs to the user," he said.

customized, turnkey private communications systems. The two companies will also jointly develop next-generation TETRA solutions.

"We definitely intend to sell TETRA equipment in North America," said Steve Savor, chief executive of Com-Net Ericsson.

Nokia is studying the market requirements and preparing to sell land-mobile radio systems in the United States and Canada.

"Nokia wants to see a fair chance to compete in the market, especially the 700MHz public safety band, before Nokia can proceed ahead with the full-scale investment necessary to begin business in the category, in this region," said Paul Pettersson, Nokia's director of TETRA business development. "It is hard to estimate how much time is needed because the answer depends on the regulatory decisions and decisions of other suppliers.

"We have been approached by a number of well-informed user organizations in public safety, utility and other professional areas. Apparently, there is a need for a serious alternative system supplier in the market," Pettersson said.

With more than 10,000 employees, Nokia already has a substantial presence in the North American wireless telephone market. While it also sells land mobile radio products, Nokia is primarily a radio system supplier.

"In North America, we would market the radio systems by ourselves, but we would seek alliances with companies in other related areas, such as system integration," Pettersson said.

Simoco, a UK-based manufacturer and successor to Philips Radio Communications Systems, has a global TETRA marketing strategy. It is seeking partners in anticipation of selling TETRA systems in North America. Simoco and Nokia have licensed their essential TETRA IPR to each other for worldwide use.

In the United States, TETRA might be most easily adapted for the new 764MHz-776MHz/

Mark Hoppe

The interim chairman of the North American TETRA Forum, Mark Hoppe, said: "In areas where it's cost-prohibitive to provide a 700MHz or 800MHz solution independent of protocol, I think VHF Project 25 will be the solution. Another reason for Phase I VHF is because of heavy use by federal users with whom the local users must communicate. In some areas, that is very important for local users to have interoperability.

"Although the TIA process is important, it is not necessary for selling two-way radio products in the United States. SmartNet, SmartZone, IDEN, non-totally Project 25 compliant versions of Astro—none of those are TIA-approved. Yet, Motorola feels that TIA approval is necessary before TETRA is sold in the marketplace. It seems inconsistent with their own practice."

794MHz-806MHz public safety frequencies (the "700MHz band") reallocated from TV broadcasting. Those frequencies are subject to a TV station relocation period extending to 2006 or well beyond for stations now occupying the band.

'Project 25 TETRA'

The Project 25 Steering Committee voted in November 1999 to accept a four-slot TDMA proposal from the TETRA MoU to use TETRA as the baseline for a new Project 25 four-slot TDMA standard. They also accepted a separate two-slot TDMA technology proposal from Com-Net Ericsson to use as a baseline for a new two-slot TDMA proposal. If and when Project 25 incorporates a four-slot TDMA standard, "it will meet the needs of the majority of the North American public safety users, which means it will have a compliant interoperability mode," said Craig Jorgensen, co-chairman of the Project 25 Steering Committee. To fit Project 25's requirements, the baseline TDMA proposal, among other things, must be modified to include a different vocoder (the device that converts voice to binary code) and different encryption algorithms for

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greater compatibility with existing Project 25 FDMA standards for 12.5kHz channels.

All Project 25 standards, including the vocoder, encryption and common air interface, must have

AI Duddles

An SMR system operator for 15 years before selling his systems to Mobex, Al Duddles of Gem Communications in Boise, ID, later became Mobex's technologist. Retired, he continues to consult to Mobex and other clients.

"TETRA is spectrum-efficient and data-friendly. It has multiple manufacturers for infrastructure and subscriber units. Full-duplex subscriber units are available, which is important because many analog SMR equipment manufacturers have discontinued duplex units for lack of sufficient demand. Yet, with TETRA, worldwide demand for duplex units sustains their manufacture," he said.

Duddles said that despite a continuing demand for analog service, many SMR operators must accept that customers believe digital is better.

"Many customers think they need digital SMR to get the same audio quality that other digital wireless services promote. In other cases, analog SMRs lose customers to digital services that are more data-friendly and more secure. Most digital systems can be encrypted if necessary, but just being digital gives some security that you don't have with analog. And digital offers better voice quality without static or noise out to where it crashes. To be competitive, to be mainstream, you have to have digital technology," Duddles said.

Duddles explained that small SMR operators also can benefit from TETRA's spectrum efficiency. He said that hundreds of SMR operators in rural and small markets lack channels for expansion.

"TETRA is a little bit easier to start out small and expand than some other digital technologies are, which is appealing to small SMRs. You can operate TETRA single-site and single-channel if you want. It's more scalable, although the scalability is not so much governed by the technology itself as by the manufacturers' implementation," he said.

interoperability. Other technology changes may be recommended and approved as the standards process moves forward.

Some call the modification "P25 TETRA," but that's not an official Project 25 term. Through current TIA subcommittee work, a four-slot TDMA TETRA-based specification will become part of the TIA standards. If IPR cross-licensing follows, some manufacturers might make P25 four-slot TDMA equipment specifically for North America. What would be lost, though, is part of the economy of scale of a single, worldwide TETRA.

Some call the existing TETRA standard "native TETRA." Parallel to their Project 25 four-slot TDMA work, these native TETRA proponents are ushering native TETRA through the TIA baseline reference to existing ETSI documentation, into the TIA standards documentation framework. Meetings have been scheduled that are intended to lead to a TIA membership vote on a native TETRA standard by early next year.

The TIA project description suggests that the P25 four-slot TDMA specification may be available by the end of 2001. A Motorola representative estimated the process might take two to four years, however.

Jorgensen estimated four to six years at the current pace, adding, "The TIA standards process, as I understand it, is open, deliberative and evolutionary. It encourages its members and others to offer alternative technical standards proposals beyond those currently being deliberated. Those alternatives or recommendations can be proposed at any time during the process and must be given full consideration by each of the appropriate TIA groups. That means that throughout the process, the original proposed baseline can be modified and changed to better meet the needs of the North American public-safety users."

Bill Burrows

A team leader for the Radio Test Set Team at IFR Systems in Wichita, KS, Bill Burrows, said that TETRA is appropriate for North America.

"I see Project 25 and TETRA as not being competitors but being complementary in many ways. Project 25, as a frequency-division system, is good and gives coverage in rural areas.

"TETRA would be spectrally efficient in urban areas. Interworking between TETRA and frequency-division technologies such as Project 25 would give an advantage and a system adaptable to various population densities," he said.

Burrows worked with TETRA technology in Europe before relocating to Wichita. His background also includes work with Project 25.

"TETRA is good in crowded spectrum in Europe and is not so efficient in rural areas where it needs a cellular-like infrastructure. As a time-division technology, TETRA's cell size is governed by timing constraints of the TDMA signal. With frequency division, range really is controlled by the transmitter power of the base station and mobiles. You can cover the mobiles' inadequacy with repeaters, which is a relatively cheap solution," he said.

Many people are members of both the native TETRA and Project 25 committees. Separate meetings are held to minimize confusion regarding which standard is being discussed and to avoid the appearance that Project 25 steering committees themselves are having anything to do with the native TETRA standard. If native TETRA becomes a standard first, cross-licensing among IPR-holders could follow, and TETRA products might be sold in North America in a year's time.

Finding frequencies would be challenging. At VHF highband and UHF, where new channels are assigned at 12.5kHz bandwidths, a licensee would have to aggregate channels for a 25kHz bandwidth to fit native TETRA. Even when the FCC would allow such use, finding clear frequencies would be extremely difficult.

Interoperability

Large segments of the public-safety community want interoperability, and for many of them, interoperability means Project 25 technology. Native TETRA stimulates competition among manufacturers, which often leads to apparently lower prices, but it is not interoperable with Project 25 technology.

Jorgensen explained that the Project 25 standards have been based on the assumption that an agency would buy the technology that would best satisfy its operational and user requirements.

"In some cases that would, in fact, be a proprietary technology—say, an EDACS system. It may be a Project 25 standardized system. It could be a system like a TETRA or Matra or any other kind of technology. What should drive the acquisition of technology is not just that a standard is in place, but the needs of that specific community.

The Project 25 standards are predicated on the assumption that the needs fit the requirements of the standard, including interoperability, a backward migration path and a forward migration path—what we call a transparent migration path. It includes simulcast, direct mode and other uniquely public safety requirements.

Joe Gallelli

Contracted by Simoco to assist with its North American business development, Joe Gallelli believes that Motorola's position—that the TETRA IPR Undertaking permits withholding IPR licensing in North America—lacks support by either ETSI policy or the ETSI secretariat.

Gallelli said that by Motorola's decision, "North America is restricted from an open standard promulgated by ETSI. It's interesting that Motorola sells TETRA throughout the world with the exception of North America, including the use of distributors. The plot thickens when you consider Motorola's position in our market and the likely investment in proprietary technology for this market, such as Astro—now marketed with enhancements for Project 25 as 'Astro25.'"

Gallelli called the 24MHz of spectrum allocated in the 700MHz band for pub-

lic safety radio "the U.S. green space equivalent" to Europe's 380MHz–400MHz band that allows 6.25kHz to be the "standard radio communications slot in Europe and many other places in the world."

He took issue with the notion that either TETRA or Project 25 might be especially suited to either urban or rural areas.

"It is silly to describe the 350-400 million-population European demography as urban when it includes the Alps and Pyrenees mountains, steppes, Scandinavia and Turkey, for example. Europe includes urban centers and wide areas of suburban and rural population from the Midlands of the United Kingdom to the south of Italy. I would make a case for many similarities to the U.S. demography with some exceptions in the desert Southwest and other high desert and Great Plains ranching and farming areas," Gallelli said.

If you don't have those needs, you shouldn't be spending money on that technology. You should spend it on the technology that best suits you," Jorgensen said.

"If and when a native TETRA is available in the United States and public safety agencies buy it, we would assume that they're making a decision based on what's best for them. We obviously support that decision because the individual public safety managers are in a far better position to make such a focused decision

than we. Our standards shouldn't in any way be construed as attempting to limit people from using alternatives or implying that they should use alternatives. In fact, in every article and every commentary we've ever had with regard to Project 25, we tried to make that one point very clear: that people buy based on what their needs are," Jorgensen said. ■

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CIRCLE (32) ON FAST FACT CARD

Supporting a two-party system

Site infrastructure for wireless messaging that was used to support the national political conventions also shows promise for disaster relief and site startup applications.

By Sean Petty

Political conventions and disasters may not have much in common (or maybe they do),

lifesaver when disaster strikes.

WebLink Wireless' strategic partner, Metrocall, teamed with *Congressional Quarterly* to provide wireless data services to the news media and party officials at the 2000 Republican and Democratic National Conventions. Metrocall turned to WebLink Wireless to ensure that the convention centers in Philadelphia and Los Angeles had adequate coverage for these services.

Metrocall used the two-way wireless data service to help news media at the conventions stay in touch. *CQ* provided two-way wireless devices—Motorola T900s—to news media. Reporters could then receive instant notification about any hot news at the convention. Reporters could also use the wireless messaging feature of the devices to query the *CQ* staff for any research requests and to receive the results wirelessly. It was like having a private news wire on their belts. More than 350 members of the media got the devices at the Republican convention in Philadelphia, and because the same service was later offered at the Democratic convention in Los Angeles, reporters could use the same devices at that convention.

The key challenge at both conventions was in-building coverage. When a large building, such as a convention center, is decked out for a political convention, getting signals into and out of the building becomes problematic. With the bleachers for convention attendees, intricate stages and

the wealth of electronics that go into putting on a meeting of that size, the building becomes much more of a challenge to provide reliable coverage. A typical advanced messaging device has an output power of about 600mW, so it becomes essential to have a nearby receiver.

For crucial, time-sensitive messages like those being sent to and from reporters, the message paths needed to be reliable. Extensive testing was performed over two days prior to the convention to identify areas that would need special attention, as it was essential to ensure that there were no coverage gaps.

WebLink Wireless had an easy solution: a mobile unit that creates a temporary extra site. The self-contained unit, a small equipment shelter on a trailer with a tower and a VSAT satellite dish, requires only about an hour of setup time once it arrives at the location for the temporary site. On-site workers only have to raise the tower and optimize the satellite path. The unit, which has its own gas-powered generator that provides about 30 hours of continuous operation, operates independently of any phone connection and can be controlled and monitored remotely through an IP-based network via satellite. The trailer is only about 23 feet



Sites such as this one, erected for the Republican National Convention in Philadelphia, have emergency applications, too.

but in terms of two-way data services, this summer's political conventions provided a communications model that could be a

Petty is a system engineer at WebLink Wireless in Philadelphia. You can email him at sean.petty@weblinkwireless.com.

long, and the accompanying shelter is about 8 feet x 8 feet. An SUV or pickup truck can be used to position the trailer at any location.

At the Republican National Convention in Philadelphia, this setup was a sharp contrast to what other wireless carriers did. Some brought in construction trailers and mounted antennas and equipment to the building. Others had to plan in advance to get high-speed data lines connected so messages from the convention center could be delivered to their networks. Others needed on-site construction cranes to set up and eventually dismantle their towers. Because WebLink Wireless uses a two-way satellite network for traffic delivery, messages could be sent from the convention wirelessly, with no connection to the local physical infrastructure.

Conventions to catastrophes

While this application of two-way wireless data was effective and helpful, it demonstrated that two-way service provided through a temporary site could be useful in even more critical situations, such as a natural disaster. Communications are crucial during disaster response efforts, but a disaster like a hurricane, earthquake or tornado often disrupts ordinary lines of communication. Landlines are damaged or overwhelmed by traffic. Wireless towers may be toppled. A mobile unit like the one used to provide coverage at the political conventions could be the solution. It can be set up quickly, and because it's self-contained, it doesn't rely on any of the existing infrastructure that might have been damaged. The unit can provide wireless data coverage even if local power is out and local phone lines aren't working.

Although wireless data may not seem an obvious choice for disaster communications, it does have some unique advantages. One advantage is a broadcast capability. Just as breaking news items were

broadcast to all reporters at the political conventions, important information can be simultaneously transmitted to all relief workers at a disaster location. Information such as weather updates, locations of relief services or the arrival of supplies can be broadcast to a large number of people simultaneously. With the exception of two-way public safety radio, that message distribution is difficult to accomplish with voice communications. Because the message information is also stored on the device, busy workers wouldn't have to try to take notes from radio voice transmissions. When they needed to access the information, it would be there. With the two-way wireless data capability, they could also respond with questions or supply requests, and they could send information from their location, such as casualty or damage reports. The two-way wireless data network connects to the Internet, so all of this information can be sent instantly anywhere in the world. Relief workers could also access Internet information on demand.

Getting a site up and running

Another scenario, less dramatic than disaster applications but still requisite to network buildouts, is using a temporary site unit to provide coverage until a permanent base station can be built. This could be important to a carrier that wants to provide premium service to a new corporate customer in a location that isn't adequately served by the existing infrastructure. With a temporary site in place, the carrier can begin serving the customer immediately.

It's important that carriers treat these temporary base stations the same way they'd treat a permanent installation. All of the considerations that go into the planning stages during the construction of a typical tower site must be taken into account. Security and safety are key concerns. These sites are often set up in places where people aren't accustomed to see-



Wireless messaging devices, such as Motorola's T900 communicator, can be used in conjunction with a temporary purposed transmission site.

ing radio towers, such as parking lots at convention centers. This could tempt the curious to try to see just what is in that little trailer. Just as carriers would fence a regular site, a longer-term installation requires the construction of temporary fencing to keep the equipment secure.

Many of these telescoping towers can extend to 100 feet, so it's important to consider the location of the unit and its surroundings. The fall zone should be evaluated, and the final location of the site should be carefully planned.

Two-way wireless data offers a great deal of flexibility for creating temporary sites, whether for a big planned event like a political convention or for an unexpected natural disaster. This flexibility in providing coverage allows wireless data to support a number of applications, such as broadcast information and two-way messaging. ■

What you should know about refarming

What do the refarming orders *really* mean, and how do they affect your decision to use centralized or decentralized UHF trunking?

By Robert J. Speidel

"Refarming" is subject to misunderstanding and misinformation. Refarming is the FCC's procedure to increase the capacity of the FCC land mobile radio spectrum below 512MHz. Refarming has been an ongoing process for almost 10 years, but many people are still uncertain what refarming actually requires and doesn't require.

Many people incorrectly believe that refarming requires licensees

refarming. There is no such thing. This refarming proceeding only applied to the FCC LMR spectrum below 800MHz, which is, in reality, only the LMR spectrum below 512MHz.

So refarming does not require mandatory narrowbanding or changes at 800/900MHz.

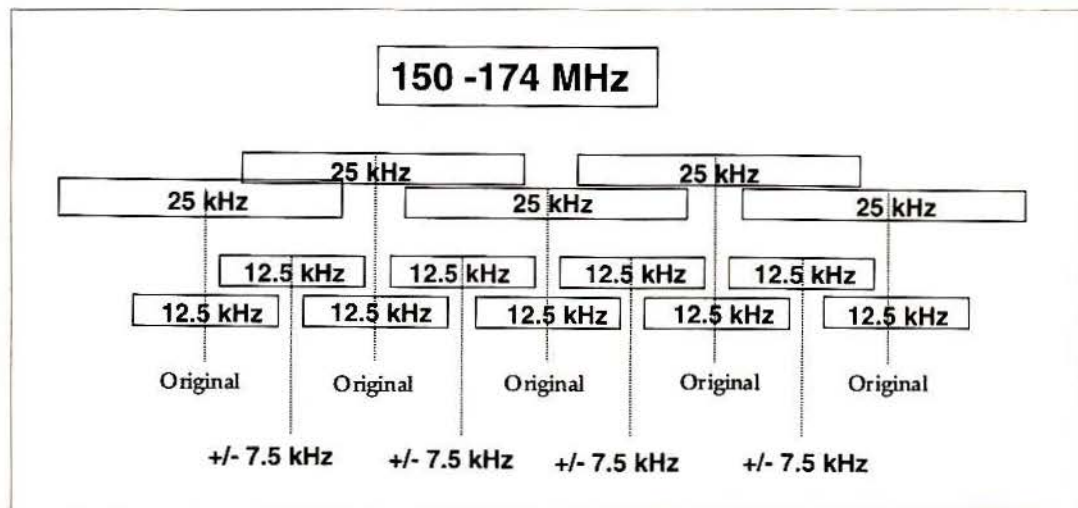
Refarming *did* change the channel spacing in the 150MHz–174MHz VHF band and in the

25kHz apart. The FCC wanted to quadruple the number of channels, so three channels were added between the original channel centers, thus making post-refarming UHF channel spacing 6.25kHz. Post-refarming VHF and UHF channel spacing is diagrammed at the left and on page 34.

The FCC realized that allowing wideband operations on all of the new channels in the VHF and UHF

bands could cause some confusion. So, in addition to adding channels in both bands, the FCC imposed operating bandwidth limitations for the newly added channels. In both the VHF and UHF bands, however, the FCC decided to allow a maximum operating bandwidth limitation of 25kHz on all of the original channels that existed before refarming. On the new VHF channels—those displaced ± 7.5 kHz from the original channel centers—a maximum

operating bandwidth limitation of 12.5kHz was adopted. Because more channels were added in UHF, a number of operating bandwidth limitations were adopted. For those new UHF channels that are located



Channel plan for refarmed VHF highband.

to discard perfectly good wideband equipment—equipment that uses a 25kHz operating bandwidth—and replace it with narrowband equipment—equipment that uses a 12.5kHz operating bandwidth or less. Refarming does not require any licensee to discard any equipment at any time.

Others talk about 800/900MHz

450MHz–512MHz UHF band. Before refarming, channels in the VHF band were spaced 15kHz apart. As part of the refarming effort, the FCC added a channel midway between the original channel centers, making post-refarming VHF channel spacing 7.5kHz and, in effect, doubling the number of VHF channels. At UHF before refarming, channels were spaced

Speidel, an attorney, is manager of regulatory policy for Com-Net Ericsson Critical Radio Systems, Lynchburg, VA. His email address is bob.speidel@com-netericsson.com.

$\pm 12.5\text{kHz}$ from the original channel centers (midway between the original UHF channels), the operating bandwidth limitation is 12.5kHz, maximum. New UHF channels located $\pm 6.25\text{kHz}$ from the original UHF channel centers have an operating bandwidth limitation of 6.25kHz maximum. The operating bandwidth limitations for the various VHF and UHF post-refarming channels are also depicted in the diagrams.

As these diagrams show, even though operating bandwidth limitations have been imposed on the new channels, there will be an increase of interference between systems because of the overlap.

Do the rules adopted require one licensee or another to take steps to reduce this sort of interference? For example, is the licensee using a wideband-operating bandwidth

subservient to those using narrower operating bandwidths? The answer is no. As long as a licensee and the licensee's equipment are operating within the technical constraints of the license granted, there is no obligation to do anything to reduce the overlapping interference phenomena.

Having chosen to add new channels, some with operating bandwidth limitations, the FCC realized that it needed to foster the use of equipment meeting these improved spectrum efficiency benchmarks. However, the FCC did not want to be accused of subjecting licensees to another "unfunded mandate from Washington", by requiring them to migrate to narrowband equipment by some specific date. Therefore, the requirement for new spectrally efficient equipment was placed on the manufacturers

through the type-acceptance process. As of Feb. 14, 1997, any equipment submitted for type acceptance was to have the capability of providing at least one voice path per 12.5kHz of occupied bandwidth for voice communications and/or 4.8kbps per 6.25kHz of occupied bandwidth for data communications. Beginning on Jan. 1, 2005, newly developed equipment must provide at least one voice path per 6.25kHz of occupied bandwidth for voice communications to be type-accepted. Interestingly, the Jan. 1, 2005, requirement for data communications did not change.

It is important that the FCC rules concerning efficiency specifically allow for multiple-mode equipment. As long as the equipment meets the efficiency requirements in one of the modes, it is acceptable for a manufacturer to

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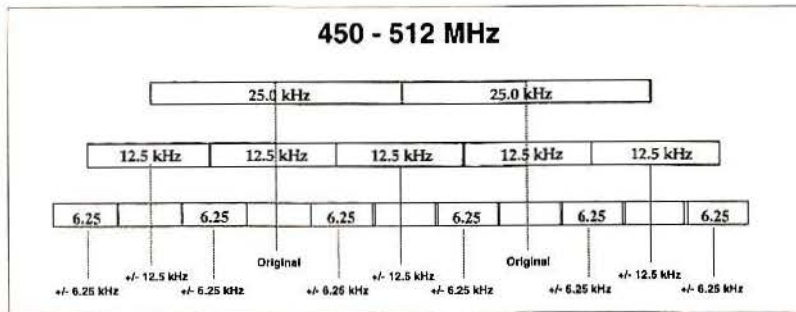
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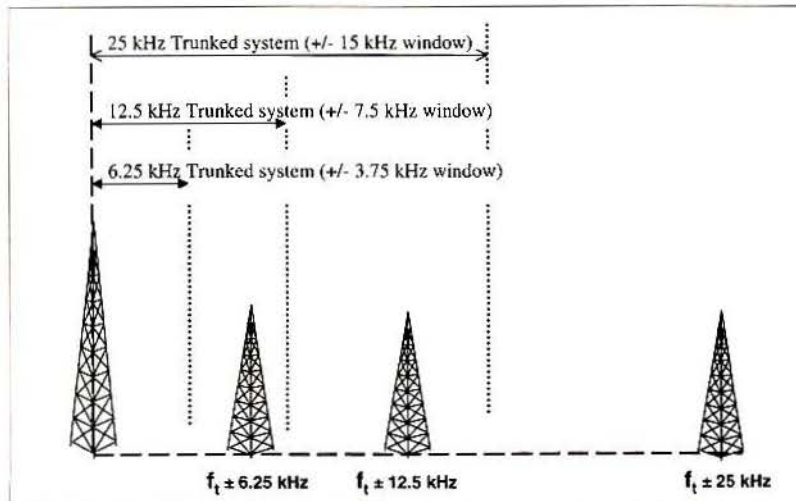
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Channel plan for refarmed UHF.



Concurrence frequency

include modes that may or may not satisfy the requirements. Likely, the net result is that 25kHz operating bandwidth equipment will continue to be available as long as it is just one of the modes in otherwise compliant multimode equipment.

Refarming adopted many other rules and standards. The FCC consolidated the 20 LMR radio services into two pools, providing licensees within a pool a greater choice of frequencies and creating some measure of competition between frequency coordinators. Antenna-height and transmit-power limitations were also adopted to limit service areas for new systems as a means of packing more licensees into a given geographic area.

However, possibly the most radical and easily misunderstood item that comes under the refarming banner is the rule adopted to provide the possibility, although

maybe not the probability, of using *centralized* trunking systems in the VHF and UHF bands where exclusive channel assignments are not common. Centralized trunked systems do not monitor the system frequencies to determine it is being used by some licensee outside of the trunked system, before the trunked system assigns that frequency to a user within the system.

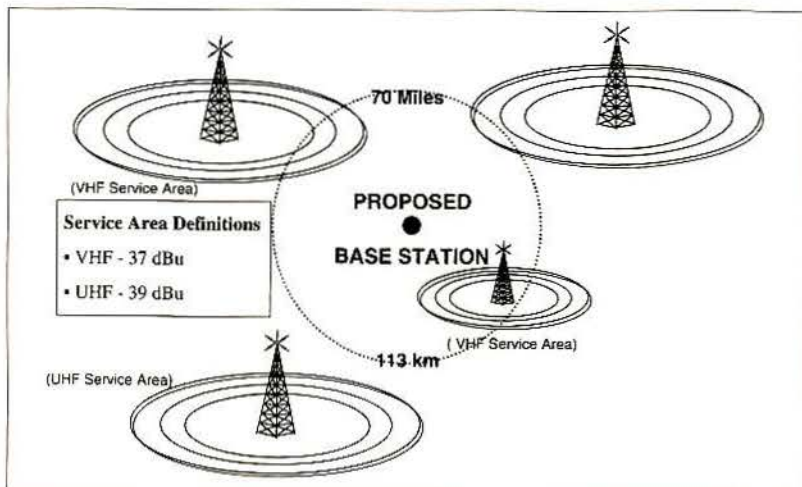
The FCC has long recognized that centralized trunked systems are effective for efficient use of limited spectrum resources, but failure to monitor would likely result in interference for other users in a shared frequency environment. While the FCC continues to investigate the concept of exclusive channel assignments for the currently shared VHF and UHF bands, it has adopted *concurrence* rules that may provide pseudo-exclusivity to those wanting to use centralized trunking at VHF

and UHF. The rules consider the closeness of the outside users' frequencies to the frequencies within the trunking system and the closeness of the outside users' service areas to the area where the trunked system is likely to cause interference.

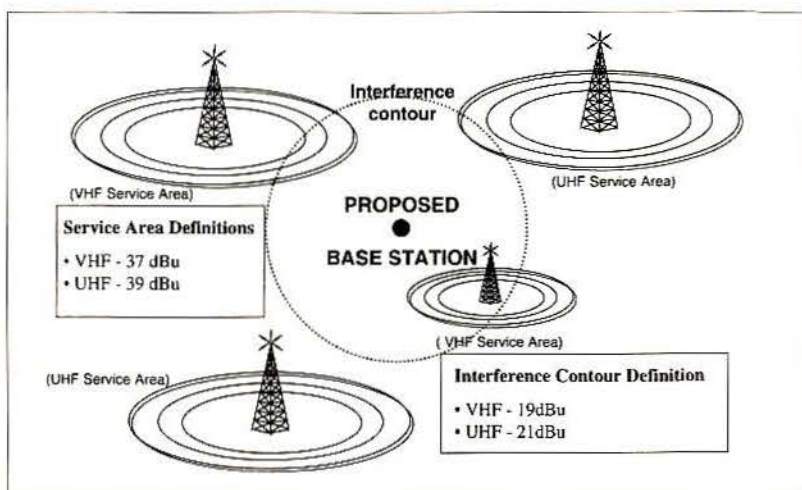
The diagram at the lower left depicts the analysis necessary to identify what frequency range is included for determining concurrence. If the proposed trunked system uses a 25kHz operating bandwidth, then the window for co-channel and adjacent-channel licensees that must be considered is ± 15 kHz from each frequency in the trunked system. If the trunked system uses 12.5kHz operating bandwidth, then the window is ± 7.5 kHz. If 6.25kHz operating bandwidth will be used in the trunked system, then the window is ± 3.75 kHz. The diagrams on page 35 show the two alternative means to evaluate the likelihood of interference to the co-channel and adjacent-channel licensees' service areas. A potential user of the trunked system can use either method to identify who must agree to the trunked system. The top diagram shows the method of comparing a 70-mile circle around the proposed trunked base stations and the service areas of the relevant co-channel and adjacent channel licensees.

The lower diagram shows the comparison between the interference contour of the proposed trunked system base stations and the same service areas. In either analysis, if the service area of the co-channel or adjacent-channel licensee is touched by the 70-mile circle or by the interference contour, as appropriate, then that co-channel or adjacent-channel licensee must agree, in writing, with the centralized trunking proposal.

The final result of making the comparisons of frequencies and areas may be a long list of licensees, and each must consent to the use of centralized trunking. A person proposing to use centralized trunking is well-advised to select



Geographic concurrence (comparison of the 70-mile radius to service areas).



Geographic concurrence (comparison of interference contour to service areas).

frequencies, operating bandwidths and comparison methods to pare a potentially long list to the absolute minimum.

Another question may be, "We know what the rules say, but does refarming really *accomplish* anything?" That is a question with as many reasonable answers as there are people who have asked the question. Refarming is still not officially accomplished. Changes may occur in the future as part of refarming or as part of other FCC proceedings. ■

For more information

If you have any questions about refarming, please seek assistance from competent, unbiased sources. Refer to the refarming FAQ on the FCC Web site www.fcc.gov/wtb/plmrs/refarmfq.html or to the "Refarming—Truths & Myths" booklet prepared by Ralph Haller and myself. The booklet is available for free in hard copy or electronic copy by calling me at (804) 385-2465 or email me at Bob.Speidel@com-netericsson.com.

—R.S.

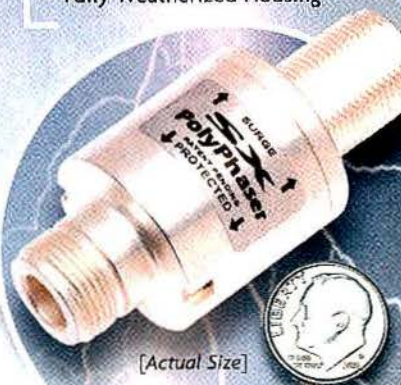
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The following pages contain mobile radio, paging and cellular products and services of advertisers in this issue. Information is provided by the advertisers. For more information on these products, refer to the advertiser's Web address or phone number. Also, refer to the Advertiser Index on page 39 for the page reference to the company's advertisement.



Base station controller

The DSPatch base station controller from **Avtec** is a processor-based remote radio controller capable of providing voice communications and radio control from a central dispatch office. Modes of operation include: packet voice (VoFR) with digital backup; leased circuit; dial-up; and digital voice base stations (e.g., APCO P-25).

WWW.AVTEC.COM OR 803-892-2181



Receiver system

The Coyote from **Berkeley Varitronics Systems** features hot-swappable components, allowing for versatile field use, including removable, independent receiver modules, GPS receiver, rechargeable Li-ion battery and compact ATA flash.

WWW.BVSYSTEMS.COM

Internet-ready dial tone

The i-WLL Trailblazer from **Carlson Wireless Technologies** delivers network dial tone to remote users with wireline-quality dial-up modem speeds and voice clarity. The fixed-point, all-digital product extends two lines to 14 miles LOS. It offers easy installation and a low power draw. No tuning is necessary.

WWW.WIRELESS-TELEPHONE.COM



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DTMF decoder

Communications Specialists manufactures, sells and supports the Selectone model ST-809B multi-output DTMF decoder. At 1.34" x 0.855" x 0.21", the decoder is suited for many special applications. PC programmable features include remote reset, confirmation tone and radio "kill" function.

WWW.COM-SPEC.COM



Self-contained radio site

The OpenSky self-contained radio site from **M/A-COM** contains trunking base station radios and all the other network routing and RF equipment necessary to provide cellular coverage. The equipment is housed in an aluminum shelter with integral air conditioning and can be transported by truck.

WWW.MACOM.COM OR 978-442-4047



Wireless headset

The **PowerCom** headset from **Pel-tor** allows for clear two-way communications in noisy environments. It is a self-contained unit operating on the license-free FRS band, and it offers both PTT and VOX on all available channels. It also includes a noise-canceling microphone and NRR 26dB.

WWW.AERO.COM



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Speaker microphone

Shure Communications' 810 Modu-link speaker microphone features a sealed, gasketed splash-proof design with a rugged Armour casing. It also offers a million-cycle, silver-plated PTT switch and meets the MIL-STD 810E driven-rain test.

WWW.SHURECOMM.COM



Tower-top amplifiers

TX RX Systems' Smart-backup system for the 746MHz-901MHz range provides redundant pin diode-switched LNAs and a default bypass mode with switching and reporting, all via the single RF coaxial cable connection in a 6" x 6" x 24" steel weathertight enclosure.

WWW.TXRX.COM OR 716-549-4700



Control console

The **Vega C-1610** six-line control console modular design offers flexibility in system integration. It provides a keypad for programming level settings, tone timing sequence and assignment of alphanumeric characters. The vacuum fluorescent display indicates time and audio level.

WWW.VEGA-SIGNALING.COM

Common controller

The model 4020 from **Zetron** is a 20-channel common controller that supports as many as six series 4000 operating positions including the model 4217NT dispatch workstation, 4118 rack-mount button console and the 4018 desktop button console. The architecture and feature set of the 4020 are identical to that of the 4048.

WWW.ZETRON.COM OR 425-820-6363



Company	Page Number	Fast Fact Number	Advertiser Hotline	Company	Page Number	Fast Fact Number	Advertiser Hotline
AC/DC Industries	49	109	281-933-0909	Motorola Test Equipment	15	14	800-505-TEST
Aerocomm	23	30	201-227-0066	Narda/L3 Comms.	27	31	631-231-1700
Anritsu	19	25	800-ANR-ITSU	New Hampshire Comms.	48	105	603-668-3004
Astron Corp.	13	11	949-458-7277	Norcomm Corp.	37	42	800-874-8663
Avtec, Inc.	PS9	23	803-892-2181	Open Sky	PS3	16
Berkeley Varitronics	11	10	908-548-3737	Peltor	PS5	19	508-764-5720
Carlson Wireless	14	12	707-923-9593	Polaris Industries	50	110	404-872-0722
David Clark, Inc	PS10	24	508-751-5800	Polyphaser Corp.	35	35	800-325-7170
Crescend Technologies	33	33	800-872-6233	Premier Comms.	22	29	714-257-0300
Comms. Specialists	BC	3	800-854-0547	Radiomate	43	41	925-676-3376
Comnet-Ericsson	37	43	804-528-7456	Ramsey Electronics	46	120	800-446-2295
Computer Resources	50	112	205-987-1523	RCC Consultants	53	117	732-404-2400
Control Signal Corp	42	40	800-521-2203	RCW Distributing	47	106	612-808-0069
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Earmark Inc.	36	36	203-777-2130	Softwright	51	116	303-344-5486
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EL Paso Comm. Syst.	49	108	915-533-5119	Telepath	51	114	510-656-5600
EML	49	107	615-771-2560	Telewave Inc.	5	6	650-968-4400
Fiplex Comm. Inc.	29	32	305-884-8991	Thunder Eagle	38	38	703-242-0122
The Genesis Group	50	111	903-561-6673	Trident Micro Systems ...	20	27	800-798-7881
Icom America	9	8	206-450-6041	TX RX Systems Inc.	3	5	716-549-4700
IFR Systems, Inc. RF Div.	PS1	15	316-522-4981	Vega/Telex Signaling	10	9	402-467-5321
Industry Click	17	25	609-720-4617	VERTEX/YAESU USA .IFC	1	310-404-2700
I-Tech	PS8	22	619-458-1500	Vocom Products	48	104	800-872-6233
Kenwood Comms.	IBC	2	800-950-5005	WETEC.	47	100	901-286-6275
Klein Electronics	48	103	760-781-3232	W & W Mfg.	7	7	800-221-0732
Marketronics Corp.	PS6	20	954-846-1011	Zetron	PS7	21	425-820-6363

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Tuning In

Andrews, Wall to head Intertec

The publisher of *Mobile Radio Technology*, Intertec Publishing, Overland Park, KS, has new management. The change, announced on Dec. 1, 2000, more closely links Intertec with its business-to-business Internet sister company, IndustryClick, Princeton, NJ. Both companies are subsidiaries of PRIMEDIA, New York.

Tim Andrews, president and chief executive officer of IndustryClick, adds to his responsibilities with an appointment as chief executive of Intertec. Ron Wall, Intertec's chief operating officer, moves up to president of the company. Cameron Bishop, who had served Intertec as president and CEO, has left the com-

pany. Dan Altman, Intertec's executive vice president and chief financial officer, also has left the company.

David Ferm, president PRIMEDIA's Business-to-Business Group, said that the changes represent continuing efforts to sharpen PRIMEDIA's focus on enhancing revenue growth by integrating its traditional and new media businesses under single leadership, particularly in the area of sales management. The integration is intended to enable PRIMEDIA's traditional print publications, new media properties, industry research, exhibitions, conferences, consulting and video assets to create and offer more effective, multiplatform, targeted customer solutions. —DB

IBM, Infineon unveil magnetic memory chip

IBM, Armonk, NY, and Infineon Technologies, Munich, Germany, announced the companies' joint development of magnetic random-access memory chips that use magnetism, rather than electrical charges, to store data bits.

The switch from electrical to magnetic memory could have a fundamental impact on cellphones and laptop computers. Turning on a computer could become an instantaneous procedure, and users could be

able to leave a laptop on for years without draining the battery's power.

"Potentially this could change the memory business very dramatically," said Bijan Davari, head of IBM's technology and emerging products in the company's microelectronics division. "But the key word is 'potentially.'"

The change will not, however, happen over night. Commercial production of MRAM chips will not be online in volume until 2004.

Scanning...

Motorola, Schaumburg, IL, appointed Marketronics of Sunrise, FL to distribute its line of professional radios, focusing on the South Florida market. We can only hope that Marketronics' board members don't decide to recount their vote to sign the contract.

So now they think they can conquer space, too, huh? Motorola sent its advanced RF communications equipment to space on the space shuttle Discovery. The equipment will be used in linking the International Space Station to Earth. Planetary two-way radio is so five minutes ago.

COMARCO, Irvine, CA, acquired EDX Engineering, Eugene, OR. COMARCO plans to operate EDX as a division of Comarco Wireless Technologies, and it will retain the EDX name.

Racal Communications, Rockville, MD,

won a contract to supply the U.S. Marine Corps with radio headsets to be used during military missions. The headsets were tested during "urban warrior exercises" at the Marine Corps Warfighting Laboratory, so they *must* be tough.

The General Services Administration awarded Klein Wireless, Escondido, CA, a two-year contract to provide the U.S. government with wireless products and services. The contract has a maximum value of \$48 million, and it is extendable to five years.

HTE, Lake Mary, FL, and PSG, Orlando, FL, kissed, made up and agreed to end litigation, with HTE agreeing to remarket PSG's Pocket Cop and PSG agreeing to stop developing products in direct competition with HTE. Ahhh, the holidays. They bring out the best in us all. —MH



Headset withstands harsh environment

Eartec's Monarch headset withstands a tough environment. It features a flexible backband molded with polymer PBT. The wraparound design offers a low-fatigue fit even when worn with safety helmets. The headset features a flexible, goose-

neck microphone and slimline receivers. It includes an inline PTT assembly rated at 30,000 operations and a connector for a portable transceiver.

WWW.EARTEC.COM
OR 800-399-5994

Earpiece works for surveillance

Motorola's Completely Discreet Earpiece (RLN-4922A) is for use with Motorola two-way radios and surveillance kits. It is designed for police officers, public safety officials and security operatives who require full freedom of movement, enabling them to easily communicate without visible equipment. Two-way radios can be hidden under clothing, and users can transmit communication through the wireless earpiece via an inductive neckloop connected to a Motorola two- or three-wire surveillance kit.

WWW.MOT.COM OR 800-422-4210

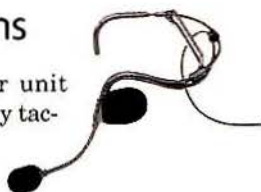


Headset allows discreet communications

The Ranger from **Otto Communications** provides clarity and discreet two-way radio communications. It is worn behind the head with an adjustable frame system. The speaker rotates to allow for adjustment and comfort. The headset is water-, wind- and dust-proof. It is a slim,

lightweight single-ear unit that is suitable for many tactical applications. It can also handle harsh environments. Applications include: SWAT, bike/motorcycle patrol and mounted patrol.

WWW.OTTOENG.COM OR 888-234-6886



Headsets offer custom full-flex boom

Sigtronics' noise-attenuating headsets from **Quala-Tel Enterprises** feature a custom flex boom that makes positioning possible in minimum time, even with gloves on, and rotates 180° for use on either side of the head. The high-noise eliminator microphone offers clear voice communications. The

headsets are RFI- and EMI-free electronics with 24dB noise reduction for compliance with NFPA 1500. The self-receiver elements are not affected by temperature or humidity.

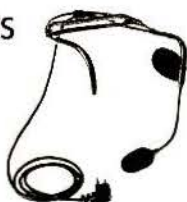
WWW.QUALATEL.COM OR
888-442-1504



Headset fits behind the head

Headset USA's Life-guard headset series from **Klein Electronics** is a lightweight, behind-the-head headset for SWAT, military, police and security. This redesigned product is available in a variety of configurations including: heavy-duty, medium-duty, waterproof, single or dual speaker, acoustic tube earpiece and noise-canceling mic. The headset also offers three PTT button styles to meet rugged demands.

WWW.KLEINELECTRONICS.COM



Headsets support military applications

Telex Communications' Land Mobile Division has developed the Stinger headsets for military and law enforcement applications. The Stinger combat headset clamps to either side of military or tactical helmets, replacing headgear normally worn under helmets. A fully adjustable flex boom and articulating speaker deliver clear transmit and receive audio. The unit includes a waterproof microphone

and a water-resistant speaker and cabling. The lightweight tactical/bicycle Stinger also incorporates a waterproof microphone and a water-resistant speaker. Options include a throat mic for use in biochemical suits. You can order a separate version with an optional acoustic tube, putting receive in the ear for high-noise environments or discreet communications.

WWW.TELEXLMR.COM OR 800-752-7560

Wireless headset incorporate two-way radio

Earmark's wireless radio headsets are two-way, portable radios built into noise-reducing earmuffs. The company can tailor headsets to

specific applications by offering three operating modes: duplex, simplex or half-duplex.

WWW.EARMARK.COM OR 203-777-2130

Product encore

Of the new products in the May 2000 issue, this one generated the biggest reader response. For more information on this product, log on to www.comtelco.net.



Antennas offer tubular dipole

Comtelco's BSXL base antennas feature a tubular dipole element structure and a fiber-glass radome. The antennas' aluminum bases are covered with a tough epoxy coating. They provide N connector termination and include a complete water-drainage system. Most units in the series are available custom-tuned to the desired center frequency, from 45MHz to 2.5GHz. Antennas are available with gain from 3dB to 6.5dB, impedance ratings of 50Ω, power ratings ranging from 100W to 250W and VSWR from 1.5:1 to 2:1.

WWW.COMTELCO.NET OR 800-790-9894

CAD system supports selective calling

Fleetsync Kencall from IDA is a CAD system for assisting dispatchers in management of voice communications and text messaging. The system supports Fleetsync selective calling, inter-fleet calling, status

messaging, emergency and dispatcher remote stun, and text messaging. Incoming calls and text messages can be prioritized and sequenced for quick response.

WWW.IDACO.COM OR 701-280-1122

Microphone picks up vibrations in skull

The skull microphone system from Otto Communications is designed for most breathing apparatus applications.



The lightweight unit is a combination of a skull mic, ear cup receiver and 80mm body PTT. The system picks

up the voice through bone vibrations in the head. The mic and ear cup assemblies are encapsulated in molded rubber shells for comfort and protection from the elements. The kit is compatible for four- or five-point facepiece harnesses and webbed-backed harnesses.

WWW.OTTOENG.COM OR 888-234-6886

Notebook computer offers Pentium III

The Gobook from Itronix is a notebook PC designed for rugged indoor and outdoor use in field-based mobile workforces. The computer offers an Intel Pentium III or Celeron CPU that delivers 600MHz of processing power, 256MB SDRAM, a 2.5" 6, 10, or 20GB hard drive, and 12.1" SVGA TFT color display with three-button touch-pad navigation. It uses common radio module architecture field-upgradable wireless capability that allows users to change networks in the field.



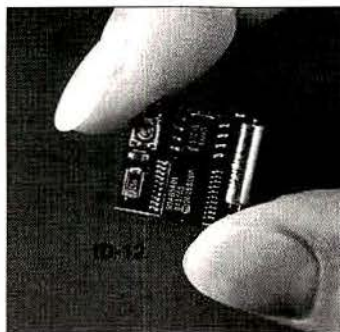
WWW.ITRONIX.COM

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ID-12

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CIRCLE (40) ON FAST FACT CARD

Replacement batteries offer flex circuitry



M9012, M9012C, M9009, M9009-H and M9009-HX rechargeable

replacement batteries from **Multiplier Industries** are designed for the Motorola HT750/1250/1500 and GP320/340/360/380 radios. The batteries incorporate flex circuitry with surface-mounted components. The casing is made from a polycarbonate plastic that increases impact strength by five times. The company's Sure-grip surface is available on each battery model.

WWW.MULTIPLIER.COM OR 914-241-1103

Coax connectors offer silver-plated contacts

The 7/16 DIN series coaxial connectors from **RF Industries** are designed for use with LMR-600 low-loss cable from Times Microwave and CSW600R low-loss cable from CommScope. The RFD-1604-2L2 is a 7/16 DIN male crimp and the RFD-1631-2L2 is a 7/16 DIN female crimp connector. Both feature silver-plated contacts and Teflon insulation.

WWW.RFINDUSTRIES.COM OR 800-233-1728

Repeater maker provides remote access

Midian Electronics' RM-1 is a repeater maker with Morse Code Station ID. The RM-1 incorporates a DTMF decoder to provide remote access and closure. Other standard

features include a courtesy tone, PTT time-out-timer, two programmable messages or station IDs, and a remote enabling/disabling of the repeater.

WWW.MIDIANS.COM OR 800-643-4267



HEADSETS

HEADSETS

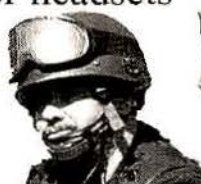
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2001

January

6-9: International CES, sponsored by the Consumer Electronics Manufacturers' Association; Las Vegas Convention Center, Las Vegas Hilton, Riviera Hotel and Alexis Park Hotel, Las Vegas. Contact: www.CESweb.org.

8: Minnesota Public Safety Region 22 Planning Committee for 700MHz; Minnesota Department of Transportation, Arden Hills Training Center. Contact: Andy Terry, 651-296-7402.

11: Missouri Public Safety Region 24 Planning Committee for 700MHz; St. Louis County Emergency Operations Center, Chesterfield, MO. Contact: Stephen Devine, 573-526-6105.

February

20-23: NATE, sponsored by the National Association of Tower Erectors, Adam's Mark Hotel, Dallas. Contact: 888-882-5865 or www.natehome.com.

March

20-22: Wireless, sponsored by the Cellular Telecommunications Industry Association, Las Vegas. Contact: 202-785-2842 or www.wow-com.com.

28-30: International Wireless Communications Expo, sponsored by

Mobile Radio Technology, Las Vegas Convention Center, Las Vegas. Contact: Web site www.iwceconexpo.com.

29: Simulcast Forum 2001, sponsored by Simulcast Solutions, Hilton Hotel, Las Vegas. Contact: Ed O'Connor at 716-223-4927 or www.simulcast-solutions.com/calendar.htm.

April

1-4: ENTELEC, sponsored by ENTELEC, New Orleans. Contact: 281-357-8700 or Web site www.entelec.org.
24-27: APCO North Central Regional Conference, sponsored by the Association of Public Safety Communications Officials-International, Radisson Hotel, Bismark, ND. Contact: Rick Hessinger, 701-328-8153.

May

6-9: Spring Vehicular Technology Conference, sponsored by the IEEE Vehicular Technology Society, David Intercontinental Hotel, Tel Aviv, Israel. Contact: 972-3-6133340 or www.congress.co.il/ieee_news/index1.html.

13-17: APCO East Coast Regional Conference, sponsored by the Association of Public Safety Officials-International, Lancaster Host Resort, Lancaster,

PA. Contact: Jay Groce III, 610-344-5084.

16-18: PCIA Tower and Site Management Conference, sponsored by the Personal Communications Industry Association, Doral Golf Resort and Spa, Miami. Contact: 703-739-0300.

21-24: Telecommunications Resellers Association Spring Conference and Exhibition, sponsored by TRA, Adam's Mark Hotel, Dallas. Contact: www.tra.org.

June

3-7: Supercomm, sponsored by TIA and USTA, Georgia World Congress Center, Atlanta. Contact: 800-278-7372.

24-27: UTC Telecom, sponsored by UTC, the United Telecom Council, Midwest Express Center, Milwaukee. Contact: 202-857-1881 or www.utc.org.

24-28: NENA, sponsored by the National Emergency Number Association, Orlando, FL. Contact: Web site www.nena9-1-1.org.

August

5-9: Association of Public-Safety Communications Officials-International (APCO) National Conference, Salt Lake City. Contact: 904-322-2500 or www.apco-intl.org.

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Changes at Andrew, Orland Park, IL:

Guy M. Campbell, president, assumes the position of chief executive of the company. **Charles Nicholas**, executive vice president, administration and finance, accepts appointment to vice chairman of the board.

Devra Herlin of Relm Wireless, West Melbourne, FL, advances to vice president of federal sales.

Changes at Sabre Communications, Sioux City, IA:

Pam Washburn, production control assistant, moves up to inside sales manager. **Jeff DeGroot**, contract administrator, advances to construction group manager.

Changes at IFR Systems, Wichita, KS:

Lynn K. Giles, director of human resources for Philips Electronics, joins IFR as vice president of human resources. **Deborah Stockman**, of the marketing communications division at New Technology, Wichita KS, joins the company as marketing communications manager.

Changes at The United Telecom Council:

Jill M. Lyon, senior vice president for regulatory relation for the American Mobile Telecommunications Association, joins the council as vice president and general counsel. **Jerry Obrist**, chief engineer-waterworks for Lincoln Water System, joins the organization as vice chairman.

John Binkley, vice president of the Kentucky region for Crown Castle, Pittsburgh, becomes vice president of the company's Illinois region.

The following company address was incorrect in the December 2000 MRT Buyers' Guide:

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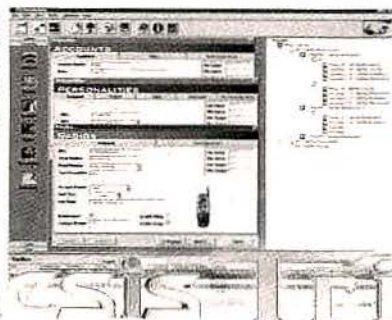
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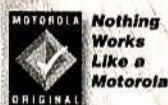
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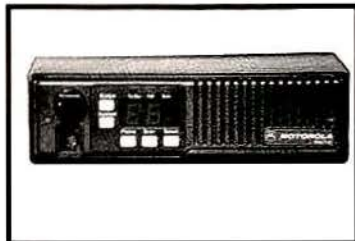
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CIRCLE (117) ON FAST FACT CARD

Get off the sideline and into the game

By Alan Van Velkinburgh

When Dave Keckler, *MRT*'s technical editor, asked if I'd be interested in contributing the first entry for this new *MRT* column, I said "Sure, why not? What a *great* opportunity. I'm sure I have lots to say that your readers will find interesting."

Little did I realize the challenge before me.

But then I got to thinking about "challenge" and the challenge that all of us face in our respective businesses. And, more important than thinking about it, what are we *doing* about it?

Quickly, before I get started, I want to tell you about an article I just finished for our company newsletter and how it relates to what we're doing here. It was titled "Tamales 101." Now, that's

not some kind of "Texas thing," even though Texas *does* have some of the best tamales in the world. The article was actually a challenge to our employees to commit themselves to self-improvement and/or continuing education.

Let me know if you want a copy, and I'll email it to you.

Now, back to business. What *are* we doing about our businesses and ourselves? Just as we need our employees and associates to take the initiative and make the commitment to improve, we as owners and managers have an even larger responsibility. We have to chart the course for our business, and we have to lead by example. It's not enough that we all face the "New Millennium." (I never thought the "New Millennium" started in 2000—I mean, who starts counting at "0"?) We all face changes in technology and regulation.

Well, we will all improve our chances of survival and success if we invest time in our businesses

and ourselves. So where do we start? We start with planning. That's right, *planning!* When is the last time you sat down and revised your business plan? Maybe the better question is "Have you ever *formalized* your business plan?" Yeah, you know: *think* about what you're doing, what you're *going* to do and then write it down. Then, use it as a road map. Refer back to it. Change it. Challenge it. Revise it. Share it. Commit yourself and your organization to it.

Next, get involved in the industry. Get into the game and off of the sidelines. I have found that my involvement in the Council of Independent Communications Suppliers has been a worthwhile investment of my time and money. The things I have learned, and the people I have met: soooooo worthwhile and valuable. By the way, if you think CICS is for you (and I certainly think it is a meaningful and purposeful organization), please drop me an email and we'll visit.

And yes, don't forget "Tamales 101." It's all about self-improvement and continuing education. Yes, I know we are all getting the educations of our lives just running a business, but don't forget to take some time out for yourself. A class at a community college, a seminar sponsored by your Chamber of Commerce or even just a good business book or business audio tape is a start. These kinds of things will mean a lot to you in the long run, and they will have an immediate impact on your peers, associates and/or employees.

Self-improvement, continuing education, planning and involvement—great things to do in preparation for the "New Millennium."

Van Velkinburgh is president of Houston 2-Way Radio, Houston. He is also chairman of the Council of Independent Communications Suppliers, a separate market council of the Industrial Telecommunications Association. You can email Van Velkinburgh c/o mrt@mrtmag.com, or at alv@h2wr.com.

Dealers: This is *your* forum

This month *MRT* debuts a new, rotating, guest editorial column: "Point-of Sale Perspective." This space will be a soapbox for opinions and editorials contributed from our dealer audience.

Each month, a different radio equipment dealer will discuss the business issue he or she is most encouraged by, or the one that really gets under his or her skin. Unlike "Letters to the Editor," *MRT* will pay a writer's fee for each "POS Perspective" column accepted for publication.

Commentaries should be about about 500–700 words long. There is no restriction on the business topic, and there will be no "Sacred Cows." Although we will print complaints, we also hope to unearth points for optimism about being a two-way dealer and ways to improve one's business model or practices. We encourage our dealer readers to feel that they "own" this column.

Because *MRT* is prepared about 45 to 60 days ahead of the cover date, comments on general trends may also be more timely than reactions to specific news or events that are current at the time the contributor is writing. Submissions for consideration for the March issue, for example, need be received by mid-January.

Dealers interested in contributing to this column should contact David Keckler, technical editor, by email at david_keckler@intertec.com.

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\$54.95 (model TS-64DS with DIP switch, \$57.95)

ST-20, 25, 50

Voice Encryption Units
PRIVATE COLLECTION series provides low to high level
security for two-way radio voice applications.
PC programmable with optional kit.
0.9" x 1.5" x 0.25"
\$79.00 - \$299.00

ST-804A

Multi Format Encoder
Encodes Two-Tone Sequential, Burst Tone,
or DTMF ANI/ENI Formats.
PC programmable with optional kit,
or factory programmed for free.
1.15" x 0.84" x 0.15"
\$59.95

ST-809B

Multi Output DTMF Decoder
Decodes address codes of 1 to 7 digits from
all 16 DTMF characters.
Multiple outputs and remote reset capability.
PC programmable with optional kit, or factory
programmable for free.
1.34" x 0.85" x 0.21"
\$59.95

ST-888

Desktop ANI Decoder / Display Unit
Use with ST-804A or other DTMF ANI encoders for
monitoring of fleet radio users and control systems.
\$499.00



COMMUNICATIONS SPECIALISTS, INC.

426 WEST TAFT AVENUE • ORANGE, CA 92665-4296

(714) 998-3021 • FAX (714) 974-3420

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